REGISTER

OF

THE LEHIGH UNIVERSITY,

1893-1894.

SOUTH BETHLEHEM, PA.
1893.

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THE LEHIGH UNIVERSITY,

SOUTH BETHLEHEM, PA.

1893-1894.

FOUNDED BY ASA PACKER.

BETHLEHEM, PA.:
Times Publishing Company.
1893.

TABULAR ALMANAC.

1893.

JULY.

S	M	T	W	T	F	S
...	...	...	...	...	...	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	...	...	...	...	...

AUGUST.

S	M	T	W	T	F	S
...	...	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	...	...
...	...	...	...	...	...	...

SEPTEMBER.

S	M	T	W	T	F	S
...	...	...	...	...	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
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OCTOBER.

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
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NOVEMBER.

S	M	T	W	T	F	S
...	...	...	1	2	3	4
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12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	...	...
...	...	...	...	...	...	...

DECEMBER.

S	M	T	W	T	F	S
...	...	...	...	...	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31	...	...	...	...	...	...

1894.

JANUARY.

S	M	T	W	T	F	
...	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
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FEBRUARY.

S	M	T	W	T	F	S
...	...	...	...	1	2	3
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18	19	20	21	22	23	24
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MARCH.

S	M	T	W	T	F	S
...	...	...	...	1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31
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APRIL.

S	M	T	W	T	F	S
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MAY.

S	M	T	W	T	F	S
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JUNE.

S	M	T	W	T	F	S
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10	11	12	13	14	15	16
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24	25	26	27	28	29	30
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JULY.

S	M	T	W	T	F	S
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AUGUST.

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SEPTEMBER.

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OCTOBER.

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NOVEMBER.

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DECEMBER.

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1895.

JANUARY.

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FEBRUARY.

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MARCH.

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24	25	26	27	28	29	30
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APRIL.

S	M	T	W	T	F	S
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MAY.

S	M	T	W	T	F	S
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12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	...
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JUNE.

S	M	T	W	T	F	S
...	...	...	...	...	...	1
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9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
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CALENDAR.

1893.	1893-1894.	
Sept. 9, 11, 12,	Saturday, Monday, and Tuesday,	Examinations for Admission.
Sept. 13,	Wednesday, . .	First Term begins.
Oct. 12,	Thursday, . .	Founder's Day.
Nov. 30,	Thursday, . .	Thanksgiving Day.
Dec. 20,	Wednesday, .	First Term ends.
1894.		
Jan. 9, 10,	Tuesday and Wednesday,	Examinations for Admission to Second Term.
Jan. 10,	Wednesday, .	Second Term begins.
Jan. 20,	Saturday, . .	JuniorPrizeOrations due.
Feb. 7,	Wednesday, .	Ash Wednesday.
Feb. 22,	Thursday, . .	Washington's Birthday.
March 22,	Thursday, . .	Easter Holidays begin.
March 27,	Tuesday, . .	Easter Holidays end at 8¼ A.M.
May 28,	Monday, . .	University Day Orations due.
May 30,	Wednesday, . .	Theses of Seniors due.
May 30,	Wednesday, .	Senior Examinations begin.
June 11,	Monday, . . .	Annual Examinations begin.
June 17,	Sunday, . .	Baccalaureate Sermon.
June 18,	Monday, . . .	Class Day.
June 20,	Wednesday, .	University Day.
Jun. 21, 22, 23,	Thursday, Friday, and Saturday,	Examinations for Admission.

1894.	1894-1895.	
Sept. 8, 10, 11,	Saturday, Monday, and Tuesday,	Examinations for Admission.
Sept. 12,	Wednesday, . .	First Term begins.
Oct. 11,	Thursday, . .	Founder's Day.
Nov. 29,	Thursday, . .	Thanksgiving Day.
Dec. 19,	Wednesday, .	First Term ends.
1895.		
Jan. 8, 9,	Tuesday and Wednesday,	Examinations for Admission to Second Term.
Jan. 9,	Wednesday, . .	Second Term begins.
June 19,	Wednesday, .	University Day.

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---

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	COURSE.	RESIDENCE.
Herman Leon Arbenz,	C.E.,	Wheeling, W. Va.
Chester Terrill Ayres,	E.E.,	Williamsport.
Franklin Baker, jr.,	E.M.,	Philadelphia.
Clarence Kemble Baldwin,	M.E.,	Philadelphia.
*Anthony Francis Bannon, jr.,	C.E.,	Bradford.
John Collinson Barber,	C.E.,	Conaways, Md.
Robert Josiah Bartholomew,	M.E.,	Bath.
Rollin Calvert Bastress,	C.E.,	Sunbury.
Harry Wilber Beach,	M.E.,	Montrose.
George Beggs, jr.,	C.E.,	Reading.
John Henry Best,	C.E.,	Mechanicsburg.
*Haldeman Bigler,	A.C.,	Harrisburg.
Ernest Mar Blehl,	E.E.,	Philadelphia.
*William Bowie, B.S.,	C.E.,	Annapolis Jun., Md.
Charles Sumner Bricker,	M.E.,	Lititz.
James Emery Brooks,	M.E.,	East Orange, N. J.
Eugene Clare Brown,	E.E.,	Washington, D. C.

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*Not clear of conditions.

	COURSE.	RESIDENCE.
William Henry Brown,	E.M.,	Yatesville.
Walter Turpin Brown,	C.E.,	Centreville, Md.
*James Hodgson Budd,	C.E.,	Middletown, Del.
*Charles Calvin Burgess,	C.E.,	Flemington, N. J.
John Thomas Callaghan, jr.,	E.M.,	Washington, D. C.
Francis Lee Castleman,	C.E.,	Gaylord, Va.
Robert Edes Chetwood, jr.,	E.E.,	Elizabeth, N. J.
*Edward Bailey Clark,	M.E.,	Columbia, S. C.
*Norman Frederic Clark,	E.E.,	Philadelphia.
Arthur Stebbins Clift,	M.E.,	Croton Falls, N. Y.
*Edward Perrine Cody,	C.E.,	Philadelphia.
William Wheeler Coleman,	E.M.,	Baltimore, Md.
William J. Collier,	C.E.,	Duncannon.
Herbert Maurice Crawford,	C.E.,	Manorville.
*Henry M. S. Cressman,	Clas.,	Sellersville.
Howard Stephen Dech,	M.E.,	Bethlehem.
Henry De Huff,	E.E.,	Lebanon.
Stanley Chipman de Witt,	E.E.,	Halifax, N. S.
James Chambers Dick,	C.E.,	Brockwayville.
*Benjamin Irvin Drake,	E.M.,	South Bethlehem.
Beekman Dubarry, jr.,	M.E.,	Washington, D. C.
Howard Eckfeldt,	E.M.,	Conshohocken.
*Alfred Wm. Alexander Eden,	C.E.,	Brown's Town, Jamaica.
Edward L. Faison, jr.,	C.E.,	Elliott, N. C.
Guy Hector Farman,	E.M.,	Westfield, Vt.
Edward Calvin Ferriday,	Clas.,	South Bethlehem.
Walter Ferris,	M.E.,	Wilmington, Del.
Curtis Bertram Flory,	E.E.,	Scranton.
†Clarence Richard Fountain,	E.E.,	Good Hope, D. C.
George Lane Gabrio,	E.E.,	Hazleton.
Andres Garza Galan,	C.E.,	Saltillo, Mex.
*Eduardo Antonio Giberga,	M.E.,	Matanza, Cuba.
John Jameson Gibson,	E.E.,	York.
Elmer Grant Godshalk,	A.C.,	Lansdale.
Wallace Russell Goss,	C.E.,	Union, S. C.

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* Not clear of conditions.

† Excused.

	COURSE.	RESIDENCE.
William Heald Groverman,	M.E.,	Oakland, Md.
*Frederick Taylor Haines,	C.E.,	Elkton, Md.
*Thomas Graham Hamilton,	E.E.,	Pittsburgh.
†Robert Rieman Harvey,	E.E.,	Wilkes-Barre.
Thomas Lloyd Henry,	C.E.,	Troy, N. Y.
*Howard Samuel Hess,	Clas.,	Hellertown.
Ira Miller Higbee,	C.E.,	Watsontown.
William Hopkins,	E.E.,	Washington, D. C.
*Edgar Alonzo Houston,	C.E.,	Bellvale, N. Y.
Drew William Irvine,	E.E.,	Columbia, Tenn.
Elmer Augustus Jacoby,	Clas.,	Locust Valley.
William Agassiz James,	E.M.,	Wilkes-Barre.
Henry Scudder Jaudon,	C.E.,	Savannah, Ga.
Albert Beardsley Jessup,	E.E.,	Scranton.
Elisha Barton John,	C.E.,	Bloomsburg.
Victor Albert Johnson,	E.M.,	St. Paul, Minn.
Henry Harrison Jones,	C.E.,	Reading.
Adolph Somers Kappella,	E.E.,	Philadelphia.
Dixon Kautz,	L.S.,	Moweaqua, Ill.
Warren Byron Keim,	C.E.,	Reading.
Henry Edward Kip,	Arch.,	Buffalo, N. Y.
David Henshey Lackey,	E.E.,	Altoona.
William Allen Lambert,	Clas.,	Hellertown.
Louis Edgar Lannan,	E.E.,	Washington, D. C.
Arthur Hughes Lewis,	E.M.,	Plains.
*Gerald Lewis,	A.C.,	Milford.
Benjamin W. Loeb,	A.C.,	Reading.
Philip Theodore Lovering,	E.E.,	Minneapolis, Minn.
Robert A. McKee,	M.E.,	Towanda.
Fayette Avery McKenzie,	Sci.,	Montrose.
Stuart Tuttle McKenzie,	C.E.,	Montrose.
Norman Peach Massey,	C.E.,	Chestertown, Md.
Charles Frazier Maurice,	C.E.,	Athens.
John Samuel Miller,	M.E.,	Harrisburg.
*Archibald D. Morris,	M.E.,	Bristol.
Eugene Mowlds,	C.E.,	West Conshohocken.

* Not clear of conditions.

† Excused.

	Course.	Residence.
William Spencer Murray,	E.E.,	Annapolis, Md.
Robert Neilson, Jr.,	C.E.,	Williamsport.
Walter R. Okeson,	C.E.,	Bethlehem.
Charles B. Pennell,	M.E.,	Duncannon.
James Harry Philips,	C.E.,	Atglen.
Joseph Philips, Jr.,	E.M.,	Nashville, Tenn.
Wilbur Orton Polhemus,	C.E.,	Valley Cottage, N. Y.
*John Livingston Poultney,	M.E.,	Baltimore, Md.
*Edward Christopher Price,	A.C.,	Centreville, Md.
Henry Crider Quigley,	E.E.,	Harrisburg.
Homer Austin Reid,	C.E.,	Warren, O.
William Reinecke, jr.,	E.E.,	Louisville, Ky.
Eugene Jesse Rights,	C.E.,	Tahlequah, Ind. Ty.
Herbert Timothy Rights,	C.E.,	Tahlequah, Ind. Ty.
Clement Clarence Rutter,	C.E.,	Lansford.
Harry Kent Seltzer,	C.E.,	Ephrata.
John Egbert Shero,	A.C.,	Fredonia, N. Y.
*Luther D. Showalter,	C.E.,	Pottstown.
Robert S. Siegel,	Clas.,	Bethlehem.
*Edwin Harrison Sigison,	E.E.,	Buffalo, N. Y.
John Blake Slack,	E.E.,	Paducah, Ky.
Edward George Steinmetz,	E.E.,	Philadelphia.
John Eugene Stocker,	Sci.,	Bethlehem.
Robert Melvin Tarleton,	E.M.,	Baltimore, Md.
Robert Sayre Taylor,	Sci.,	Bethlehem.
*Walter Allison Thacher,	C.E.,	Camden, N. J.
Nathaniel Thurlow,	A.C.,	Lancaster.
Charles Frederick Townsend,	Arch.,	Willimantic, Conn.
Joseph Boyer Townsend,	E.E.,	Venetia.
*Frederick John Van Benthem van den Bergh,	C.E.,	Lyndon, Kan.
Willard Randolph Van Liew,	E.M.,	Neshanic, N. J.
*Geo. Brinkerhoff Van Riper,	A.C.,	Rutherford, N. J.
Charles Henry Vansant,	C.E.,	Eddington.
William Warr,	E.E.,	Philadelphia.
Harry Dallam Webster,	M.E.,	Baltimore, Md.
Fred Irving Wheeler,	C.E.,	Pawtucket, R. I.

* Not clear of conditions.

	COURSE.	RESIDENCE.
*William Gwilym Whildin,	E.M.,	Lansford.
Harry Amasa White,	E.E.,	Philadelphia.
John Crum Whitmoyer,	E.E.,	Harrisburg.
Edward Newton Wigfall,	A.C.,	Philadelphia.
John Marion Wilson,	C.E.,	Hillsboro, Md.
Harold L. Wood,	A.C.,	Upper Montclair, N.J.
Carlos Yglesias,	E.M.,	San José, Costa Rica, [C.A.
Harry Bernard Zimmele,	A.C.,	Bethlehem.

SOPHOMORE CLASS.

	COURSE.	RESIDENCE.
William James Adams,	E.E.,	Harrisburg.
William Stewart Ayars,	M.E.,	Wilkes-Barre.
Hobart Bentley Ayers,	M.E.,	Westerly, R. I.
Albert Doane Ayres,	C.E.,	Williamsport.
Arthur Davison Badgley,	E.E.,	South Bethlehem.
*Francis Hoskins Baldwin,	E.E.,	Atlantic City, N. J.
Hasell Wilson Baldwin,	M.E.,	Cambridge, O.
Lewis Warrington Baldwin,	C.E.,	Waterbury, Md.
Springfield Baldwin,	C.E.,	Baltimore, Md.
*Charles Herbert Barker,	E.E.,	Morant Bay, Jamaica.
Geo. Pomeroy Bartholomew,	E.M.,	Jeanesville.
Frederic Bartles,	C.E.,	Williamsport.
Charles C. W. Bauder,	E.E.,	Rheims, N. Y.
Fairfax Bayard,	C.E.,	Washington, D. C.
James George Beach,	Arch.,	Apalachin, N. Y.
Herbert Huebener Beck,	A.C.,	Lititz.
Samuel Edward Beeler,	M.E.,	Hagerstown, Md.
Edgar Tweedy Belden,	C.E.,	Stamford, Conn.
William W. M. Bending,	C.E.,	Philadelphia.
Moriz Bernstein,	C.E.,	Philadelphia.
Warren Joshua Bieber,	Clas.,	Bethlehem.
Daniel William Bliem,	C.E.,	Pottstown.
Lawrence Leander Borden,	C.E.,	Fall River, Mass.
Benjamin Franklin Bossert,	C.E.,	Phœnixville.
Howard Franklin Boyer,	Sci.,	Springtown.

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* Not clear of conditions.

	Course.	Residence.
Edward Elisha Bratton,	C.E.,	Lewistown.
Frank Shepard Bromer,	M.E.,	Schwenksville.
Maximilian Joseph Bucher,	A.C.,	Columbia.
George Buckman,	E.E.,	Penn Valley.
George Amandus Buvinger,	M.E.,	Dayton, O.
Aaron Beaumont Carpenter,	E.E.,	Avondale.
Malcolm Carrington,	E.E.,	Richmond, Va.
Frank Leslie Cooke,	E.E.,	Hackettstown, N. J.
Eckley SamuelCunningham,	M.E.,	Drifton.
Samuel Philip Curtis,	M.E.,	Penn Yan, N. Y.
Frederick Allyn Daboll,	C.E.,	Plainfield, N. J.
John William Dalman,	M.E.,	Fort Wayne, Ind.
Lewis Benjamin Davenport,	C.E.,	Baltimore, Md.
*Charles Stanley Davis,	E.M.,	Reynoldsville.
Paul Benjamin Davis,	A.C.,	Reading.
Eckford Craven DeKay,	C.E.,	New York City.
Samuel Moses Dessauer,	Arch.,	Montrose.
William Carter Dickerman,	M.E.,	Milton.
George Armstrong Dornin,	M.E.,	Norfolk, Va.
Frank Oliver Dufour,	C.E.,	Mitchellsville, Md.
Lewis Stokes Duling,	C.E.,	Philadelphia.
Edward Miall Durham, jr.,	C.E.,	Vicksburg, Miss.
*Edward Hiram Dutcher, jr.,	M.E.,	Bridgeport, Conn.
Timothy Sharpe Eden,	E.E.,	Brown's Town, Jamaica.
George Ramsey Enscoe,	C.E.,	Bennett P. O.
William Alvin Evans,	E.M.,	Summit Hill.
Charles Victor Ferriday,	M.E.,	South Bethlehem.
*Charles Albert Andrew Fink,	M.E.,	Yonkers, N. Y.
Thomas Joseph Gannon,	M.E.,	South Bethlehem.
James Brown Given,	E.E.,	Carlisle.
John Edgar Gomery,	C.E.,	Lehighton.
John Savage Graff,	E.M.,	Williamsport.
*William Morris Greenwood,	M.E.,	Bethlehem.
David Hall,	E.E.,	Fayetteville, Tenn.
Robert Graham Hengst,	E.E.,	Pittsburgh.
Harry N. Herr,	C.E.,	Wheatland Mills.
Howard Drysdale Hess,	M.E.,	Philadelphia.

* Not clear of conditions.

	Course.	Residence.
*Norman M. Holmes,	C.E.,	Stroudsburg.
Oliver Zell Howard,	M.E.,	Hagerstown, Md.
Robert Parsons Howell,	C.E.,	Blairstown, N. J.
†William Thomas Hutchins,	C.E.,	Wyoming.
*James Madison Jackson,	M.E.,	Parkersburg, W. Va.
William Steell Jackson,	E.E.,	Duncannon.
*Harvey B. Johnson,	A.C.,	South Bethlehem.
†Leroy Allen Kendall,	M.E.,	Buffalo, N. Y.
*James Keys,	C.E.,	Conshohocken.
Victor Witmer Kline,	C.E.,	Lockport, N. Y.
Robert Edwin Kresge,	A.C.,	South Bethlehem.
Robert Edward Laramy,	Clas.,	Bethlehem.
Ernest Tisdel Lefevre,	E.M.,	Panama, U. S. Col.
Robert Pierce Lentz,	M.E.,	Lehighton.
Telford Lewis,	E.M.,	Blairsville.
*Sterling Catlin Lines,	E.E.,	Wilkes-Barre.
Charles Victor Livingston,	E.E.,	Kingston. N. Y.
Bruce Emerson Loomis,	E.E.,	Wilkes-Barre.
Caleb Wheeler Lord,	M.E.,	Lebanon.
Clifford Sherron MacCalla,	E.E.,	Philadelphia.
James Gordon Mason,	E.M.,	West Pittston.
Victor Emanuel Masson,	A.C.,	Hammondsport, N. Y.
*Esteban Angel Mercenario,	M.E.,	Vera Cruz, Mex.
†William Alfred Merritt,	M.E.,	Baltimore, Md.
*George Roberts Michener,	E.M.,	Germantown.
Edward Williamson Miller,	E.M.,	Bethlehem.
Elmer Wesley Mitchell,	C.E.,	Fall River, Mass.
Rafael de la Mora,	M.E.,	Guadalajara, Mex.
Charles Howard Morgan,	E.E.,	Maxatawny.
William Hitz Mussey,	E.E.,	Washington, D. C.
John Henry Myers,	C.E.,	Lewistown.
John Buckley McBride,	C.E.,	Deckertown, N. J.
*Ellicott McConnell,	M.E.,	Philadelphia.
Burt Melville McDonald,	C.E.,	Springfield, Mass.
Harvey Frankenfield Nase,	C.E.,	Springtown.
Franklin Oberly,	E.E.,	Bethlehem.

* Not clear of conditions.

† Excused.

	COURSE.	RESIDENCE.
Louis Atwell Olney,	A.C.,	Providence, R. I.
*Miles Hallacker Orth,	C.E.,	Williamsport.
Horace Lucius Palmer,	C.E.,	Frenchtown, N. J.
Harry Richards Peck,	M.E.,	Scranton.
†Charles Warren Pettit,	C.E.,	Elmira, N. Y.
Edward Arlington Pittis,	C.E.,	Washington, D. C.
Morris Wright Pool,	M.E.,	Washington, D. C.
*Godwin Hall Powell,	E.M.,	Llanidloes, Wales.
Morris Havens Putnam,	E.E.,	Tioga.
James Lee Rankin, jr.	M.E.,	Savannah, Ga.
Henry Paul Reed,	E.E.,	New London, Conn.
John David Richards.	C.E.,	Columbus, Miss.
Chester Dawson Richmond,	E.E.,	Chattanooga, Tenn.
George Brydges Rodney,	C.E.,	New Castle, Del.
Antonio M. Ros-y-Jané,	M.E.,	Guantanamo, Cuba.
*George Homer Ruggles,	C.E.,	Cherokee, Iowa.
Auguste Leopold Saltzman,	M.E.,	Plainfield, N. J.
John Cornelius Sesser,	C.E.,	Saint Joseph, Mich.
Arthur Yeager Shepherd,	M.E.,	Wilkes-Barre.
Henry Shriver, jr.,	M.E.,	Cumberland, Md.
*Joseph Henry Siegel,	E.M.,	Salt Lake City, Utah.
John Thomas Simpson.	Arch.,	Kittanning.
*Jonathan Edward Slade,	C.E.,	Chicago, Ill.
Harvey Wilson Sprague,	M.E.,	Bethlehem.
*Alvin Riegel Sterner,	E.E.,	Bethlehem.
Ambrose B. Strickler,	M.E.,	Waynesboro.
Edward Ernest Taylor,	M.E.,	Ft. Wayne, Ind.
William Bailey Taylor,	E.E.,	Bethlehem.
John Augustus Thomson.	E.M.,	Summit Point, W. Va.
Edward Coppée Thurston,	E.M.,	South Bethlehem.
Joseph Wharton Thurston,	Clas.,	South Bethlehem.
*William Tidball,	E.E.,	New York City.
Curtis Edward Trafton,	E.E.,	Fall River, Mass.
Harry Conklin Tripp,	M.E.,	Millerton, N. Y.
George Brinton Van Brunt,	C.E.,	Long Branch, N. J.
Charles Parker Wagoner,	C.E.,	Phœnixville.

* Not clear of conditions.

† Excused.

	COURSE.	RESIDENCE.
John Scofield Wallace,	E.M.,	New Castle.
U. Grant S. Walters,	C.E.,	Pottstown.
John Eugene Weideman,	E.E.,	Washington, D.C.
Frank Thomas Weiler,	C.E.,	Pequea.
Allan Hart Whiting,	E.E.,	New York City.
*Davis S. Williams,	C.E.,	Fort Snelling, Minn.
David William Wilson, jr.,	Arch.,	Brooklyn, N. Y.
Jay Roberts Wilson,	E.E.,	Bethlehem.
Arthur Romain Womrath,	M.E.,	Pottsville.
George Fred. Y. Womrath,	E.E.,	Pottsville.
Alfred Mahlon Worstall,	E.E.,	Millville, N. J.
Hubert Harris Wright,	E.E.,	Cambridge, Md.
Frank S. Young,	E.M.,	Plymouth Meeting.
Ignacio Maria Zertuche.	E.M.,	Matehuala, Mexico.

FRESHMAN CLASS.

	COURSE.	RESIDENCE.
Harry Leigh Adams,	E.E.,	Washington, D. C.
Alfred Reginald Allen,	E.E.,	Bethlehem.
*Llewellyn Allport,	C.E.,	Philipsburg.
†Juan de Dios Amador,	M.E.,	Panama, U. S. Col.
Francis DuPont Ammen,	M.E.,	Ammendale, Md.
Henry Jonathan Biddle Baird,	A.C.,	West Chester.
Lathrop Hutchings Baldwin,	M.E.,	Allentown.
Charles Marshall Barton,	C.E.,	Pikesville, Md.
Richard Becerra, jr.,	A.C.,	New York City.
Frank Breckenridge Bell,	E.E.,	Mercer.
William Ragan Binkley,	E.E.,	Hagerstown, Md.
Thomas Hally Bissell,	E.E.,	Buffalo, N. Y.
Oliver F. Bitting,	E.E.,	South Bethlehem.
Francis Jos. Blickensderfer,	E.E.,	Bethlehem.
Henry Clay Borden,	E.M.,	Philadelphia.
Bertine Frederick Borhek,	E.E.,	Bethlehem.
†Wm. Lebbeus Bosbyshell,	E.E.,	Philadelphia.
Charles Schwartze Bowers,	E.E.,	Philadelphia.
Frank Austin Boyer,	E.M.,	Pine Grove.
John Boyt,	E.M.,	Clifton Heights.

*Not clear of conditions.

† Excused.

	COURSE.	RESIDENCE.
William Burke Brady,	M.E.,	Harrisburg.
Daniel John Broughal,	A.C.,	South Bethlehem.
Horatio Francis Brown,	M.E.,	Baltimore, Md.
Robert Berdell Cable, jr.,	M.E.,	Bethlehem.
†Edgar Carbonne y Reyes,	M.E.,	Havana, Cuba.
*David J. Castilla,	M.E.,	Coahuila, Mex.
Amado Cavazos,	M.E.,	Saltillo, Mex.
Greenleaf Howe Chasmar,	E.E.,	Brooklyn, N. Y.
Thomas Holland Clagett,	E.M.,	Berryville, Va.
Thomas Micks Clinton,	E.E.,	Baltimore, Md.
†George Henry Cox, jr.,	E.E.,	Towanda.
Barton Olmsted Curtis,	C.E.,	Iowa City, Iowa.
Patrick Edward Dinan,	A.C.,	South Bethlehem.
Louis Diven,	E.E.,	Elmira, N. Y.
Henry John Downs,	Arch.,	Steelton.
William Kuhn Dunbar,	C.E.,	Pittsburgh.
Stuart Rhett Elliott,	E.E.,	Beaufort, S.C.
John Agustus Fisher,	E.M.,	Huntingdon.
Willard Boyer Fuller,	M.E.,	Catasauqua.
Ira D. Fulmer,	E.E.,	Richland Centre.
Archibald S. Furtwangler,	C.E.,	Greensburg.
Orrin S. Good,	E.E.,	Lock Haven.
Ralph Scofield Griswold,	E.E.,	Madison, N. J.
John Lewis Gross,	M.E.,	Allentown.
Frank Hammond Gunsolus,	Arch.,	Tipton, Iowa.
Hugh Ellmaker Hale,	C.E.,	Philipsburg.
Charles Edwin Hammond,	C.E.,	Geneva, N. Y.
William Thomas Hanly,	C.E.,	Philadelphia.
*Erle Reiter Hannum,	E.E.,	Pottsville.
*George Duncan Heisey,	E.M..	Pittsburgh.
William Stephen Hiester,	E.E.,	Elmira, N. Y.
Ross Nathaniel Hood,	E.E.,	Duncannon.
Edward Smith Illig,	E.E.,	Reading.
Henry Taylor Irwin,	M.E.,	Allegheny.
Ambrosio E. Jane-y-Montoya,	M.E.,	Guantanamo, Cuba.
*Philip H. Janney,	M.E.,	Baltimore, Md.
Arthur Perkins Jenks,	E.E.,	Philadelphia.

* Not clear of conditions.
† Excused.

	COURSE.	RESIDENCE.
Harry Sackett Johnson,	E.E.,	East Aurora, N. Y.
Edward Joseph Kehoe,	E.E.,	South Bethlehem.
*Duncan Kennedy, jr.,	E.E.,	Newport, R. I.
Edwin Fitzgerald King,	E.E.,	Washington, D. C.
†Charles Henry Knight,	Clas.,	Bethlehem.
Edward Steckel Knisely,	M.E.,	Bethlehem.
Lewis Daniel Kreidler,	A.C.,	Bath.
Lawrence Rust Lee,	M.E.,	Shepherdstown, W. Va.
†John George Lehman,	M.E.,	Bethlehem.
Arthur Frost Loomis,	E.E.,	Oneida, N. Y.
*Robert Meyers Luckenbach,	A.C.,	Bethlehem.
Owen Gray MacKnight,	E.E.,	Plains.
Barry MacNutt,	E.E.,	Bethlehem.
Louis Alphonsus Marck,	E.E.,	Bradford.
Lee Holmes Marshall,	M.E.,	Pittsburgh.
William A. Megraw,	M.E.,	Baltimore, Md.
Thaddeus Merriman,	C.E.,	South Bethlehem.
Davis Levis Moore, jr.,	E.E.,	Philadelphia.
Charles R. W. Morison,	E.E.,	Ilchester, Md.
Frank Douglass Mount,	C.E.,	Manasquan, N. J.
*James Francis McCabe,	C.E.,	Baltimore, Md.
*George K. McGunnegle,	E.E.,	Meadville.
†Daniel Francis McKee,	E.M.,	Bethlehem.
Carl Pivany Nachod,	E.E.,	Philadelphia.
*Charles G. Newton,	C.E.,	Guadalajara, Mexico.
Henry H. Newton,	M.E.,	Guadalajara, Mexico.
Robert Collyer Noerr,	C.E.,	Washington, D. C.
Charles Carroll O'Donnell,	C.E.,	Connellsville.
John O'Reilly,	A.C.,	South Bethlehem.
James Harkins Pennington,	M.E.,	Yerkes.
William Lindley Pettit, jr.,	C.E.,	Fort Wayne, Ind.
*Clarence Marion Pflueger,	M.E.,	Seidersville.
Samuel Jackson Randall,	Sci.,	South Bethlehem.
John Peake Reynolds, jr.,	M.E.,	Charleston, S. C.
Samuel Stewart Riegel,	M.E.,	South Bethlehem.
Carl John Roelker,	E.E.,	Washington, D. C.
E. P. Roundey,	C.E.,	East Orange, N. J.

* Not clear of conditions.

† Excused.

	COURSE.	RESIDENCE.
Woodford Royce,	M.E.,	Willimantic, Conn.
Wallace Edgar Ruhe,	E.E.,	Allentown.
Henry Felthousen Russell.	M.E.,	Buffalo, N. Y.
*Rafael Francisco Sanchez.	E.M.,	Mantanzas, Cuba.
Benjamin Franklin Sawtelle,	E.E.,	Bethlehem.
Charles Francis Scott,	M.E.,	New York City.
Henry Hamilton Seabrook,	E.E.,	Beaufort, S. C.
Samuel Palmer Senior,	C.E.,	Washington, D. C.
Arthur Harold Serrell,	E.E.,	Plainfield, N. J.
†Gwynne Harris Sharrer,	E.E.,	Washington, D. C.
*Frank Bradley Sheaffer.	C.E.,	New Bethlehem.
Charles Shimer,	M.E..	West Bethlehem.
*Edward Peter Shuman,	C.E.,	Alllentown.
Joseph Israel Seigfried,	A.C.,	South Bethlehem.
*Michael T. Eagan Stack,	C.E.,	Shenandoah.
*Joseph Eby Stott,	E.E.,	Lancaster.
Paul Beno Straub,	E.E.,	Allegheny.
*Winfred A. Stubblebine,	M.E.,	Bethlehem.
Jack F. Symington,	M.E.,	Baltimore, Md.
*Harry Wellington Thatcher.	A.C..	South Bethlehem.
Columbus William Thorn,	C.E.,	Washington, D. C.
*William Franklin Transue,	M.E.,	South Bethlehem.
Wallace Treichler,	C.E.,	Elizabethtown.
Harry Carpenter Tschudy,	C.E.,	Smyrna, Del.
William Edward Underwood,	E.E.,	Lancaster.
Harrison Ricord Van Duyne,	C.E.,	Newark, N. J.
*Geo. Frederick Vowinckel,	E.E.,	Clarion.
James F. Wallace.	M.E.,	New Castle.
Edward Hileman Waring,	M.E.,	Plainfield, N. J.
Clarence Earl Weaver,	E.E.,	Bradford.
Frederick Charles Wettlaufer,	A.C.,	Hoboken, N. J.
Gilbert Case White,	E.E.,	Richmond, Va.
Isidore Herman Wiesenberg,	A.C.,	South Bethlehem.
William Bell Wood,	M.E..	Baltimore, Md.
Warren Worthington,	E.E.,	Rush Valley.
George Livingston Yates,	E.E.,	Carlisle.
Ambrose Everett Yohn,	M.E.,	Saxton.

* Not clear of conditions.
† Excused.

SPECIAL STUDENTS.

George William Bird, B.A.,	E.M.,	Freeland.
*Samuel William Briscoe,	E.M.,	Baltimore, Md.
Clarence A. Crane,	M.E.,	New York City.
William Jacob Hiss, jr.,	E.E.,	East Orange, N. J.
*William Sprague Maharg,	A.C.,	Bethlehem.
*Chauncey Matlock,	E.E.,	Brooklyn, N. Y.

SUMMARY OF STUDENTS BY STATES.

Vermont,	1
Massachusetts,	7
Rhode Island,	5
Connecticut,	6
New York,	43
New Jersey,	35
Pennsylvania,	275
Delaware,	5
Maryland,	40
District of Columbia,	23
Virginia,	9
West Virginia,	5
North Carolina,	3
South Carolina,	5
Georgia,	2
Alabama,	1
Mississippi,	3
Kentucky,	3
Tennessee,	5
Ohio,	6

Indiana,	3
Illinois,	6
Michigan,	1
Minnesota,	3
Iowa,	3
Kansas,	2
Utah,	1
Indian Territory,	2
Oklahoma Territory,	1
Nova Scotia,	1
Mexico,	8
Cuba,	5
Jamaica,	3
Porto Rico,	1
Costa Rica,	1
U. S. of Colombia,	2
Wales,	1
Japan,	1
	527

SUMMARY OF STUDENTS BY CLASSES AND COURSES.

	Graduates.	Seniors.	Juniors.	Sophomores.	Freshmen.	Specials.	Totals.
Classical,	4	1	6	3	1	—	15
Latin-Scientific,	1	—	1	—	—	—	2
Science and Letters,	—	—	3	1	1	—	5
Civil Engineering,	5	24	46	45	24	—	144
Mechanical Eng.,	3	20	18	38	35	1	115
Mining Eng.,	1	9	15	16	8	2	51
Electrical Eng.,	3	23	30	34	49	2	141
Analytical Chem.,	5	7	11	7	11	1	42
Architecture,	2	2	2	4	2	—	12
Totals,	24	86	132	148	131	6	527

THE LEHIGH UNIVERSITY.

ORIGIN.

The Hon. Asa Packer, of Mauch Chunk, during the year 1865, appropriated the sum of $500,000, to which he added one hundred and fifteen acres of land in South Bethlehem, to establish an educational institution in the rich and beautiful Valley of the Lehigh. From this foundation rose The Lehigh University, incorporated by the Legislature of Pennsylvania in 1866. In addition to these gifts, made during his lifetime, Judge Packer by his last will secured to the University an endowment of $1,500,000, and to the University Library one of $500,000.

DESIGN.

The original object of Judge Packer was to afford the young men of the Lehigh Valley a complete education, technical, literary, and scientific, for those professions represented in the development of the peculiar resources of the surrounding region. In furtherance of this purpose instruction is liberally provided in Civil, Mechanical, Mining, and Electrical Engineering, Chemistry, Metallurgy, Architecture, and in all needful collateral studies. A School of General Literature is also established and thoroughly equipped, with three departments, called respectively the Classical, the Latin-Scientific, and that of Science and Letters. These departments are kept up to the standard, and the requirements for entrance are the same as those of our best Classical and Literary institutions.

TUITION.

The following charges are made for tuition:

For students in the Technical courses, $100 per annum: $40 for the first term, $60 for the second term; for students in the school of General Literature, $60 per annum: $25 for the first term, $35 for the second term.

These fees include all tuition, with the use of the Library and Gymnasium, but the student is charged for materials and apparatus consumed in the Laboratories.

The Trustees have placed at the disposal of the Faculty a number of free scholarships, to be awarded to applicants of good moral character who shall pass the entrance examinations creditably, and who for other cause shall be regarded as worthy by the Faculty.

Applications for these free scholarships should be made to the President of the University.

All fees for tuition are payable to the Treasurer of the University within thirty days after the opening of the term.

PUBLIC WORSHIP.

Prayers are held in the Packer Memorial Church of the University every morning and all students are required to be present.

Divine service is held every Sunday morning in the church. The service is according to the forms of the Protestant Episcopal Church, under whose auspices the University was placed by its Founder. Attendance is required of every student, except in case of those connected with other religious bodies, to whom the President will grant permission at the beginning of each term (if requested by the parent or guardian, or by the student himself if he be 21 years of age) to attend during that term the place of worship of the body with which he is connected, where attendance on Sunday morning will be required.

SITE.

The situation of the institution is healthful and beautiful. The region is famous for its railway and manufacturing enterprises; it possesses some of the richest iron and coal mines in our land, and thus gives the students rare facilities for confirming the teachings of the recitation room by the observation of the eye.

The University buildings are about a half-mile from the depot, at the junction of the Lehigh Valley and North Pennsylvania Railroads. New York is ninety-two and Philadelphia fifty-seven miles distant.

BUILDINGS.

PACKER HALL,

named after the Founder, stands seven hundred feet back of Packer Avenue, at the base of the South Mountain. It is built of stone, and contains lecture and recitation rooms, the drawing rooms, and the museum of geology and natural history.

THE CHEMICAL LABORATORY

is thoroughly fire-proof, is built of sandstone, and is 219 feet in length by 44 in width.

There are two principal stories and a basement. The upper floor is occupied by the quantitative and the qualitative chemical laboratories, the former accommodating 48 and the latter 84 students. These rooms are 22 feet in height, and are well lighted and ventilated. A laboratory for industrial chemistry and the supply room are also on this floor.

The first floor contains a large lecture room, a recitation room, a chemical museum, and laboratories for organic, physiological, agricultural, and sanitary chemistry.

In the basement is the large laboratory for the furnace assay of ores and a well appointed laboratory for gas analysis, also rooms containing the apparatus for several processes in industrial chemistry, the engine and air-pump for vacuum filtration, a store room, and the toilet.

A photographic laboratory is located in the third story of the central portion of the building.

THE METALLURGICAL LABORATORY

contains a lecture room, a blowpipe laboratory for class instruction in blowpipe analysis and in the practical determination of crystals and minerals, a museum for mineralogical and metallurgical collections, a mineralogical laboratory provided with a Fuess reflecting goniometer, a polariscope, a Groth's "universal apparat," and a Rosenbusch polarizing microscope, a dry laboratory provided with furnaces for solid fuel and for gas with natural draught and with blast, and a wet laboratory for ordinary analytical work. It is arranged for the instruction of classes in the courses of mineralogy, metallurgy, and blowpipe analysis of the regular curriculum, and to afford facilities to a limited number of advanced students for familiarizing themselves with the methods of measurement and research employed in mineralogy and metallurgy, and for conducting original investigations in these departments of science.

THE NEW PHYSICAL LABORATORY.

This building has been finished and is now in use. It is of stone, 235 feet in length, and 4 stories in height. The first or ground floor is devoted to electrical work, and forms the Senior Electrical Laboratory. It contains a large dynamo room, with the engine, dynamos, and motors, with all their appliances; battery, balance, calorimetric rooms and workshops. The eastern part of this story has been carefully arranged for delicate work. The use of iron has been avoided; the gas and steam mains and pipes, radiators, etc., are all of brass. In this section are seven special rooms for investigations of the magnetic properties of iron and original research. A hall over 200 feet in length can be darkened and utilized for long range work in testing lamps. Under this floor is the "cave" or even temperature room, completely enclosed with solid stone masonry. On this and the other 3 floors are private laboratories, store and apparatus rooms, and offices for instructors.

The second story contains the Junior Electrical Laboratory, 56 by 44 feet; the Mechanical Laboratory, 60 by 44 feet, with tables for 80 students, the Library, a time and two balance rooms, with floors resting on solid stone arches.

On the third floor is a public hall, 70 by 44 feet, for examinations; also the professor's lecture room, 40 by 44 feet, with private laboratories, etc.

On the fourth floor in the west wing are two recitation rooms for the instructors, 40 by 18 feet, and the Heat Laboratory, 44 feet square, with tables for 72 persons. On the east side is the Light Laboratory. This contains one room with tables for 40 persons, and 8 smaller dark rooms, each of which can be divided into two parts. Besides these are 4 photographic dark rooms, 8 by 28 feet, each with all the necessary equipments.

The tower, which is devoted to meteorological purposes, has two stories of one room each, 16 by 21 feet, with a vane room above. Besides these there are several small rooms for special purposes scattered among the four floors.

The tendency in the latest and best Physical Laboratories is towards a larger number of smaller rooms, rather than to a few large rooms. It will be seen from this description that the advantages of this plan have been gained by the many smaller rooms that exist, while for general work the larger halls are provided.

Three staircases at the middle and the two ends of the building afford ample means of entrance and egress.

THE SAYRE OBSERVATORY.

Near Brodhead Avenue is the Sayre Observatory, the gift of Robert H. Sayre, Esq., of South Bethlehem, containing an equatorial and a zenith telescope, transit instrument, and astronomical clock.

THE PACKER MEMORIAL CHURCH

is the munificent gift of Mrs. Mary Packer Cummings, daughter of the Founder of the University. It is a large and magnificent Church, richly furnished and handsomely appointed in every particular. There is no more beautiful

Church edifice in the State and it is one of the noblest in all the land.

THE UNIVERSITY LIBRARY.

To the east of Packer Hall is the University Library, erected by the Founder in memory of Mrs. Lucy Packer Linderman, his daughter.

THE GYMNASIUM

is a handsome and spacious structure, built and equipped with the utmost thoroughness. It is furnished with the best patterns of gymnastic apparatus, besides Dr. Sargent's system of developing appliances. It is provided with hot and cold water; tub, sponge, and shower baths, and 389 clothes closets. Opportunities for recreation and amusement are provided in the bowling alleys. It is under the immediate care of a skilled and competent Director.

All students are required to undergo a physical examination before being allowed the use of the Gymnasium, and this examination will be repeated once each year during their stay at the University. The proper exercise is prescribed and is required of every student. These regulations are designed to promote the harmonious, symmetrical development of the individual student.

EXPENSES.

Books, materials, paper, pencils, materials used in the chemical laboratories, and drawing instruments are furnished by the student. Materials consumed in the chemical laboratories can be obtained from the University, their value being covered by a deposit made at the opening of that term in which the laboratory work is to be done.

Rooms and board can not be had in University buildings, but can readily be obtained in many private houses.

The following is an estimate of the necessary expenses for the collegiate year, clothing and traveling not included :

Tuition,	$100	$100
Board for 40 weeks, from	160 to	200
Room-rent, with fuel and lights	40 "	80
Care of room and use of furniture,	5 "	20
Washing and incidentals.	20 "	40
Books, stationery, etc.,	25 "	50
Total,	$350 to	$490

(In the case of students in the School of General Literature, the totals will be $310 to $450.)

NOTE.—If clubs be formed the cost of board need not exceed $3.50 per week.

ADMISSION OF STUDENTS.

The Register is intended to give all necessary information concerning the admission of students. Application may be made to the President of the University if information is desired which is not given in the Register.

DATE OF EXAMINATIONS.

Examinations for admission to the University are held at the opening of each term, and also in June at the close of the academic year.

The examinations for 1894 will be on Tuesday and Wednesday, January 9 and 10, for admission to the second term; on Thursday, Friday and Saturday, June 21, 22 and 23, and on Saturday, Monday and Tuesday, September 8, 10 and 11, for admission to the first term. No other examinations for entrance will be held, except for good cause, and all applicants *must* be in attendance at 9 o'clock on the morning of the first day.

The examinations are held in June and September in the following order:

First Day.—English, 9 A.M.; Arithmetic, 11 A.M.; Physics, 2 P.M.; Latin and Roman History, 2 P.M.

Second Day.—Geometry, 8.30 A.M.; Physical Geography, 11.30 A.M.; Geography, 3 P.M.; United States History, 4 P.M.

Third Day.—Algebra, 8.30 A.M.; Greek and Greek History, 2 P.M.

Applicants for entrance who wish to present certificates from preparatory schools as an equivalent for the examinations in English, Geography, and U. S. History are required to hand them to the examiner at 8.15 on the morning of the first day.

The schedules of examinations for applicants for admission to the Freshman Class at the beginning of the second term and to the Sophomore Class at the beginning of the first term may be obtained from the Secretary of the Faculty. Examinations at other than the appointed times can not be granted without great inconvenience, and candidates so applying will be required to pay a fee of $5 into the Faculty's fund for the aid of indigent students.

CHARACTER OF THE EXAMINATIONS.

The examinations are rigorous and cover the entire ground laid down in the following scheme. They are all conducted in writing, supplemented by an oral examination at the option of the examiner.

Each candidate for admission must be at least sixteen years of age and must present a testimonial of good moral character from his last instructor, or from the school or institute to which he last belonged, or from some reputable citizen of the community in which he lives.

Candidates for admission to

THE CLASSICAL COURSE

are examined in the following subjects:

1. *English.*—This requirement includes: (*a*) English Grammar, especial attention being given to the analysis and correction of sentences; and (*b*) Rhetoric and Composition. Any High School Rhetoric, such as Hart, Hill, Williams, Kellogg, and others of a like grade, will be sufficient, together with practical exercises in composition. Candidates are required to write a composition of four hundred words upon a subject announced at the time. The subject in 1894 will be taken from one of the following works: Bunyan's Pilgrim's Progress, Shakespeare's Julius Cæsar, Tennyson's Ulysses, Scott's Ivanhoe. In 1895 a subject will be taken from one of the following: Longfellow's Evangeline, Scott's Kenilworth, Dickens' Nicholas Nickleby, Gray's Elegy in a Country Churchyard.

2. *Geography*, general and political.

3. *History of the United States*, including the *Constitution.*

4. *Arithmetic*, including the metric system of weights and measures.

5. *Algebra.*—Fundamental principles. Factoring. Least common multiple. Greatest common divisor. Fractions. Involution. Evolution. Radicals. Imaginary quantities. Equations of the first and second degrees. Ratio. Proportion and progressions.

[Olney's University Algebra or Meaker's Elements of Algebra is recommended for preparation.]

6. *Geometry.*—Fundamental principles. Rectilinear figures. The circle. Proportional lines and similar figures. Comparison and measurement of the surfaces of rectilinear figures.

[Chauvenet's Geometry (four books) is recommended, that being the text-book used in the University.]

7. *Physical Geography.*

8. *Latin Grammar.*

9. *Cæsar*, four books of the Gallic war.

10. *Cicero*, six orations, including the four against Catiline.

11. *Vergil*, the first six books of the Æneid, including Prosody.

12. The translation, at sight, of passages from Cæsar and Cicero.

13. The translation of English into Latin. (As special importance is given this part of the examination, it is suggested to teachers that they connect exercises in making Latin, both oral and written, with all the studies of the preparatory course.)

14. *Roman History.*—Creighton, Pennell, or Myers.

15. *Greek Grammar.*

16. *Xenophon*, Anabasis, four books.

17. *Homer*, Iliad, first three books, including Prosody. The Catalogue of Ships may be omitted.

18. The translation, at sight, of a passage from some work of Xenophon.

19. *Greek History.*—Fyffe, Pennell, or Myers (pp. 152–357).

20. Writing Greek with accents.

The pronunciation of Greek according to the written accents is followed in the University, and it is desirable that students preparing to enter be taught this system.

Latin is pronounced according to the method generally known as the Roman Method.

THE LATIN-SCIENTIFIC COURSE.

Candidates for admission to this course must present the first fourteen of the above requirements, but substitute for the Greek sections (numbers 15–20 inclusive) the following:

21. *Geometry.*—Regular polygons. Measurement of the circle. Maxima and minima of plane figures, and plane and polyhedral angles: these constituting the subject matter of Books Five and Six of Chauvenet's Geometry.

THE COURSE IN SCIENCE AND LETTERS.

Candidates for admission to this course are examined in all the subjects demanded of those entering the Latin-Scientific Course, except the Latin and Physical Geography sections (numbers 7–14 inclusive). They also present the following:

22. *Elementary Physics.*

[Avery's Elements of Natural Philosophy (revised edition) is recommended; also Gage's Elements of Physics, if studied as intended by the author, with practical work in the laboratory by the student and the calculation of problems arising in the work.]

THE SCHOOL OF TECHNOLOGY.

Candidates for admission to the Courses in Civil Engineering, Mechanical Engineering, Mining Engineering, Electrical Engineering, Chemistry, and Architecture are examined in the following subjects:

1. *English.*—This requirement includes: (*a*) English Grammar, especial attention being given to the analysis and correction of sentences; and (*b*) Rhetoric and Composition. Any High School Rhetoric, such as Hart, Hill, Williams, Kellogg, and others of a like grade, will be sufficient, together with practical exercises in composition. Candidates are required to write a composition of four hundred words upon a subject to be announced at the time. The subject in 1894 will be taken from one of the following works: Bunyan's Pilgrim's Progress, Shakespeare's Julius Cæsar, Tennyson's Ulysses, Scott's Ivanhoe. In 1895 a subject will be taken from one of the following: Longfellow's Evangeline, Scott's Kenilworth, Dickens' Nicholas Nickleby, Gray's Elegy in a Country Churchyard. It is recommended that candidates have a knowledge of Latin Grammar, although an examination in it is not required for any courses except the Classical and the Latin-Scientific.

2. *Geography*, general and political.

3. *History of the United States*, including the *Constitution.*

4. *Arithmetic*, including the metric system of weights and measures.

5. *Algebra.*—Fundamental principles. Factoring. Least common multiple. Greatest common divisor. Fractions. Involution. Evolution. Radicals. Imaginary quantities. Equations of the first and second degrees. Ratio. Proportion and progressions.

[Olney's University Algebra or Meaker's Elements of Algebra is recommended for preparation.]

6. *Geometry.*—Fundamental principles. Rectilinear figures. The circle. Proportional lines and similar figures. Comparison and measurement of the surfaces of rectilinear figures. Regular polygons. Measurement of the circle. Maxima and minima of plane figures, and plane and polyhedral angles; these constituting the subject matter of the first six books of Chauvenet's Geometry.

[Chauvenet's Geometry is recommended, that being the text-book used in the University.]

7. *Elementary Physics.*

[Avery's Elements of Natural Philosophy (revised edition) is recommended; also Gage's Elements of Physics, if studied as intended by the author, with practical work in the laboratory and the calculation of problems arising in the work.]

Division of Entrance Examinations.

Candidates for admission to the Freshman Class may pass all the examinations in June, or all in September, or partly in June and partly in September, or may take them in *two consecutive years.* In the latter case, for the Technical courses and the course in Science and Letters, candidates may present themselves for examination in the first year in the following subjects: English, Geography, History of the United States, and Arithmetic. No credit will be given unless the candidate has passed satisfactorily in at least three subjects at one examination.

The examinations in Algebra, Geometry, and Physics must be passed in June or September of that year in which the candidate proposes to enter the University.

In the Latin-Scientific and Classical courses candidates may present themselves for examination in the first year in the following subjects: English, Geography, History of the United States, Arithmetic, Physical Geography, Roman History, and Greek History. No credit will be given unless the candidate has passed at least four of the subjects at one examination.

The examination in Latin may also be divided, but no credit will be given unless the candidate has passed in at least three of the topics specified at one examination. The examinations in the remaining subjects must be passed in June or September of that year in which the candidate proposes to enter the University.

Candidates intending to enter the University in September are advised to present themselves for examination in June; if they are not fully prepared at that time they will receive credit for the examinations then satisfactorily passed.

CONDITIONAL ADMISSION.

A candidate failing to pass in one or more of the subjects required for admission may, at the discretion of the Faculty, be admitted to his class conditionally, to make up his deficiencies by extra study. When they are made up, he will be received into full standing in his class.

SPECIAL STUDENTS.

Young men of advanced standing, who do not desire to take a full regular course, can enter and select special shorter courses, with the sanction of the Faculty; but in all cases satisfactory examinations must be passed upon the subjects required for entrance to the Freshman Class.

ADMISSION TO ADVANCED STUDIES.

Candidates for admission to advanced studies *in any course* are required to pass, *in addition to the entrance examinations for that course*, examinations in the work already done by the classes which they desire to enter. These examinations are held on the same days as those for entrance to the Freshman Class.

The additional subjects may be found in the program of studies.

A diploma showing that a degree has been conferred, or a certificate of studies taken at another College will be received, in so far as it covers the subjects required for entrance, in lieu of the *Primary Entrance Examinations only.*

ADMISSION TO THE POST-GRADUATE COURSE.

Students of this University who have taken their *first* degree, and others, on presenting a diploma of an equivalent degree conferred elsewhere, are admitted to advanced studies, according to the plan to be found in the Register under the general subject of Graduate Students.

PREPARATORY SCHOOL CERTIFICATES

are not accepted so as to dispense with the primary entrance examinations.

NOTE.—The acceptance of a certificate as evidence of proficiency in lieu of examination is at the discretion of each Professor as to the subjects in his department.

PROGRAM OF STUDIES,

Showing the number of exercises per week for each subject, and the Text-books used.

The following is presented as the general program of instruction, subject to such modifications from time to time as the Faculty may deem expedient, with the approval of the Trustees.

The names of the text-books studied are generally mentioned. The number of exercises per week in each subject is indicated by the figure in parentheses immediately following.

Two hours of drawing, three of work in the laboratory, or three of practice in the field, are regarded as equivalent to a recitation or lecture of one hour's duration.

SCHOOL OF GENERAL LITERATURE.

There are three courses in the School of General Literature of the University.

I. The Classical Course includes all that is prescribed in our best institutions for the degree of Bachelor of Arts (B.A.). It covers full instruction in Greek, Latin, English, French and German, Mathematics, Astronomy, Physics, Chemistry, Geology, Physiology, Hygiene, History, Psychology, Ethics, Philosophy, Political Economy, and Constitutional Law.

II. The Latin-Scientific Course differs from the first in omitting Greek, taking in its place an increased amount of the Modern Languages and of Mathematics. Students completing this course receive the degree of Bachelor of Science (B.S.).

III. The Course in Science and Letters, for which the same degree is given as for the last mentioned, contains no

Latin or Greek, but furnishes instead extended instruction in French and German, History, General Literature, Mathematics, and General Science.

Instruction in all of these courses is given both by recitations and by lectures.

DESCRIPTION OF THE COURSES.

GREEK.—During the first term of Freshman year the class reads several books of the Odyssey, giving attention to epic forms and syntax, to prosody and scanning and to Homeric antiquities and mythology. The work of the second term is directed toward a thorough acquaintance with the idiom and vocabulary of Attic prose, as a preparation for rapid reading. The Œconomicus and Symposium of Xenophon and the Crito of Plato are read during the term, with sight readings from the Memorabilia and the Apology; accompanied with discussions of domestic life at Athens. The work of the year includes a thorough review-drill on the principles of Greek accidence and syntax, and exercises in Greek prose composition are required, based, during the second term, on the reading done by the class. Greek history is studied throughout the year, with special reference to the development of political institutions.

The Sophomore class takes up, during the first term, the study of Herodotus. Selections are made with the purpose of illustrating the author's best style and at the same time of presenting, from the original sources, the history of certain interesting epochs; the reading, after some drill on the Ionic forms, being in large part at sight. During the second term the class reads one or two plays of Euripides, with attention to the history of Greek tragedy, the life of the author and the analysis of the drama read. The lyric meters are studied, with the aim of gaining a knowledge of the rhythmical and metrical principles of Greek poetry. During this term an elective course is offered, the subject being Greek oratory, with the reading of certain orations of Lysias or Demosthenes, or both.

The Junior year is devoted to a further study of the drama, selected plays of Sophocles, Aristophanes, and Æschylus being read during the year. Work is also done in the study of public and private antiquities, partly in lectures by the professor and partly in original investigation on allotted subjects by the students.

During the first term of the Senior year the class reads either selections from Thucydides, or one of the dialogues of Plato. The second term is in part devoted to the reading of selected odes of Pindar, with careful study of the history of Greek lyric poetry and of the life and work of Pindar in particular. The course concludes with a review of the history of Greek literature, intended to summarize and harmonize the fragmentary views of the general subject gained from the study of particular authors and departments of literature.

LATIN.—Much of the training in the Freshman year is devoted to laying a good foundation in Latin grammar and in the translation of English into Latin. The authors studied are used to illustrate both of these, and a large amount is read at sight in order to cultivate quickness and readiness in the student. Roman history is begun, accompanied with full comments and lectures upon points of interest. Collateral reading will also be recommended each year throughout the course. Cicero: De Senectute and De Amicitia or the Philippics, Livy, and the Odes and Epodes of Horace are read this year. With the last named, training is given in Latin meters.

During this and the following year courses of lectures will be given upon Roman antiquities in addition to a textbook. The topography of Rome with its remains, ancient life in its various aspects, and the other departments of archæology will be discussed, illustrated by the new and extensive set of over 3100 magic lantern slides which have been prepared for this purpose.

The Sophomore year completes the text-book on Roman history. Prose composition is continued, and the subject of Synonyms taken up in connection with it. Quintilian

(Bk. X) with Crowell's Selections from the Lyric Poets will be read in the first term, and in the second the Agricola and Germania, with selections from the Annals of Tacitus, together with sight reading. An elective in Plautus is offered during this term in addition.

In the Junior year, selected letters of Cicero and Pliny are read, followed by Persius and several plays of Terence. The history of Roman literature is entered upon in the second term.

The work in the Senior year opens with Lucretius, accompanied with lectures on Roman philosophy. The course in the second term this year includes the study of ancient Latin, using Allen's Remnants of Early Latin, supplemented by a series of lectures upon Latin grammar and the history of the development of the language, together with several lectures upon the history of classical philology. Characteristic poems by various authors will be read with full comment and training in the discussion of the literary and critical points which come up.

SANSKRIT.—An elementary course in this study, conducted by the Professor of Latin, is offered as an optional during the Senior year.

HEBREW.—An elementary course in Hebrew, conducted by the Chaplain, is offered as an optional study, open to Seniors and Juniors of the whole University.

ENGLISH.—During Freshman and Sophomore years, Rhetoric is studied, both with the aid of a text-book and through practical exercises. Careful training is given in essay writing throughout the course, and orations are written and delivered during Junior and Senior years. Excellence in Oratory is encouraged by the annual contest for the Alumni Prizes, held on the 22d of February and open to the Junior Class in all departments.

The Seniors receive instruction in the principles of versification and in extemporaneous discussion, and are required to write a critique of some work selected for their examination.

The history of English literature and the philological history of the English language are studied during Junior year. These are supplemented by a series of lectures, extending through the second term, on the relations of literature to history. The course is completed by a series of lectures on English and American literature, delivered during the second term of Senior year.

ANGLO-SAXON.—An optional course in this subject is offered in Senior and Junior years.

MODERN LANGUAGES.—The study of modern languages is obligatory from the first term of the Sophomore year up to the close of the course. The student elects either French or German, or both, if time permits.

French.—The grammar is begun, reading being introduced immediately. The comparative and historical relations of the French to the English, and the connection of both with the Latin are carefully explained. As soon as possible the student is emancipated from the reader and takes up, in a progressive way, the reading of different authors; preference being given to modern writers, because it is considered to be of the highest importance that he acquire the language as it is, as an instrument whereby further knowledge can be obtained.

In the class-room, the language taught is used by the teacher as much as possible, in order that the ear of the pupil may become accustomed to its sound. Dictation is also employed, in order to give training in spelling. The rules of grammar are taught by numerous written exercises. In the second term of the Junior year, compositions in French are required, upon subjects which have been previously explained in French, in order that the student may become acquainted with different expressions and forms of construction. Before entering upon the study of an author's works, his life and literary achievements are discussed in French, which is translated, if necessary. In the Senior year, twelve lectures are delivered upon the history of

French literature. In addition to this, lectures in French upon the most distinguished modern authors are given to advanced students.

A weekly conversation-class affords opportunity for this kind of practice; and in it the events of the day and various historical and literary topics are discussed. Private courses of reading are also suggested to those who desire it.

German.—The German course follows the same plan as that laid down for the French, both as regards the methods employed and the opportunities afforded. The relations of English and German are dwelt upon and also those which connect the two languages with the Indo-European family.

MATHEMATICS.—The mathematical work is carried on during the Freshman and Sophomore years as follows:

Freshman year, first term, Chauvenet's Geometry, four exercises per week.

Second term, Olney's University Algebra, plane and spherical trigonometry, including mensuration and use of logarithmic tables, together five exercises per week throughout the term.

Sophomore year, first term, Olney's General Geometry and Davies' Analytical Geometry, four exercises per week.

Second term, Olney's Differential and Integral Calculus, four exercises per week. This term's work is elective for the Classical Course.

ASTRONOMY.—This study is taken up during the first term of the Senior year, Young's General Astronomy being used as the text-book. There are three exercises a week, and visits to the observatory help to make the work interesting as well as profitable.

CHEMISTRY.—This study includes a complete course of lectures in Freshman year upon general inorganic chemistry, in which the principles of the science are fully covered. These are illustrated by experiments, and are sufficiently extended to enable a student who desires to pursue the subject further to take analytical chemistry as an elective in the second term of the Sophomore year. The text-book used in connection with the lectures is Remsen's Inorganic Chemistry.

PHYSICS.—This important subject is presented in a course of lectures during the first term of the Sophomore year, three times a week. These are illustrated by means of the very complete apparatus of the physical laboratory. In the course in Science and Letters, the work in this branch is more extended and is identical with that given to the Civil and Mechanical Engineers. It occupies five hours a week in the first term, when heat, magnetism, and electricity are discussed. Throughout the second term, three hours a week are devoted to sound and light.

GEOLOGY.—In the second term of the Senior year, a course of lectures is given in connection with Le Conte's text-book. The general principles of the science are explained, and the theories of the formation and stratification of rocks, the successive periods of the development of the earth's crust, the extinct forms of life and similar questions are treated.

PHYSIOLOGY AND HYGIENE.—These subjects are taught in a course of lectures during the Freshman year.

HISTORY, POLITICAL SCIENCE AND LAW.—The study of history begins with a course in the political antiquities of Greece and Rome. [See the Departments of Greek and Latin.] This is followed by the study of an outline of universal history (with text-book), and this by a fuller study of the political history of recent times, especially of that of England and France. During the first term of Senior year, there is a course of lectures upon the period covered by Gibbon's Decline and Fall of the Roman Empire. This prepares the way for a course of lectures on the philosophy of history, in which it is sought to set forth the scientific methods of the study of history.

The course in history is accompanied and supplemented by courses of lectures on constitutional law with special application to the Constitution of the United States; and also on international law.

Instruction is given by lectures on the elements of political economy. The student is made familiar with the facts, methods, and doctrines of the science, and is encouraged to form and present his own opinions.

LOGIC.—Junior Class, first term, two hours weekly. Text-book, Prof. Jevons' "Lessons in Logic," supplemented by occasional lectures and by references to more extended logical treatises, such as those of J. S. Mill, Sir William Hamilton, Archbishop Thompson, Baynes' Port Royal Logic, etc.

MENTAL AND MORAL PHILOSOPHY.—The work in this department will be conducted chiefly by lectures, interrupted by occasional examinations. The courses at present are the following:

Outlines of Physiological Psychology.—Junior Class, second term. These lectures are founded principally on Wundt's lectures on the same subject, given in the University of Leipzig in the Summer of 1888, Wundt's Grundzüge der Physiologischen Psychologie, James' Psychology, Baldwin's Handbook, Ladd's Elements of Physiological Psychology, Sully's Outlines of Psychology, Carpenter's Mental Physiology, Maudsley's Physiology and Pathology of the Mind, Bain's Mind and Body, etc., with references to the classical works of Lotze, Weber, Fechner, and Helmholtz.

The History of Philosophy.—Senior Class, both terms. First term, Ancient and Medieval Philosophy. Second term, Modern Philosophy. These lectures will include a statement of the conception and problems of philosophy, a brief sketch of the great ethnical religions, and of the history of Oriental philosophy. The philosophy of the Greeks will be treated in detail, with illustrations from the writings of the philosophers.

The history of medieval philosophy will be prefaced by a short description of the philosophical ideas underlying

Christianity, and it will contain an account of the more important Church Fathers and Schoolmen.

The history of modern philosophy will begin by tracing the effect on philosophical thought of the ideas contributed by the Renascence and by the Reformation. From Lord Bacon on, a detailed history of the great modern philosophical systems will be given, which will be continued to those of our own times, including Mr. Spencer.

CHRISTIAN EVIDENCES. — Senior Class, second term. Lectures on Christian evidences, which will endeavor to treat of the subject both from the side of natural science and from that of biblical criticism.

No complete course in Ethics has as yet been established, but the history of ethics is included in the history of philosophy.

THE COURSE IN SCIENCE AND LETTERS

substitutes the following for the Latin and Greek:

DRAWING.—In the first term of the Freshman year the student is instructed in elementary projections, shading, and lettering.

ZOÖLOGY AND BIOLOGY.—The study of these subjects covers one year, beginning with the second term of Sophomore year. The work begins with a description of the various animal functions, and is extended to the comparative anatomy and physiology of the organs in typical species. Systematic zoölogy is then completed and followed by practical biology.

CHEMISTRY. — In addition to the course in general chemistry described above, three exercises a week in qualitative analysis are taken in the second term of the Freshman year.

MINERALOGY.—Instruction in mineralogy is given to the students in the Course in Science and Letters throughout the Junior year. In the first term, they attend a course of lectures on crystallography, followed by a series of practical exercises in the determination of crystalline forms by the aid of models and natural crystals.

In the second term a course on the physical properties of minerals and on descriptive mineralogy, with the use of E. S. Dana's Text-Book of Mineralogy, is followed by practical exercises in the determination of minerals.

GEOLOGY.—The study of lithology is pursued in the first term of the Senior year, with laboratory practice, Williams' Lithology being used as the text-book. During the next term, the course given above is taken with the Classical and Latin-Scientific students.

THE CLASSICAL COURSE.

FRESHMAN CLASS.

FIRST TERM.

Mathematics.—Geometry (Chauvenet). (3) Plane trigonometry. (1)

Chemistry.—Lectures. Remsen's Inorganic Chemistry. (4)

Greek.—Homer: Odyssey. Prosody. (3)

Latin.—Cicero: De Senectute and De Amicitia. Livy begun. Prose composition. (3)

Physiology and Health.—Lectures. (1)

English.—Rhetoric. (1)

Essays.

Gymnasium. (2)

SECOND TERM.

Mathematics.—Olney's University Algebra, Pt. III. (3) Plane and spherical trigonometry and mensuration. Use of logarithmic tables. (2)

Greek.—Xenophon: Œconomicus. (3)

Latin.—Livy completed. Horace: Odes and Epodes. Composition and prosody. (4)

History.—History of Greece. (2) History of Rome. (1) Roman antiquities.

English.—Rhetoric. (1)

Essays.

Gymnasium. (2)

SOPHOMORE CLASS.

FIRST TERM.

Mathematics.—Analytical geometry: Olney's General Geometry. (4)

Physics.—Lectures. (3)

French.—Whitney's Practical French Grammar. Super's French Reader. (2) Or *German.*—Brandt's Grammar. Lodeman's Manual of Exercises. Buchheim's Reader. (2)

Greek.—Herodotus. (3)

Latin.—Horace: Satires and Epistles. Composition. (2)

History.—History of Rome. (1) Antiquities.

English.—Rhetoric. (1)

Essays.

Gymnasium. (2)

SECOND TERM.

French.—Grammar and reader (continued). (2) Or *German.*—Grammar, exercises, and reader (continued). (2)

History.—Weber's Outlines of Universal History. (2)

Greek.—Euripides: Medea. (3)

Latin.—Tacitus: Agricola, Germania, and Annals, or Quintilian: Book X. Composition. (3) Antiquities.

English.—Rhetoric. (1)

Essays.

Gymnasium. (2)

In addition to the above exercises, four hours per week must be selected from the following elective studies:

Mathematics.—Differential and integral calculus: Olney. (4)

Greek.—Demosthenes: De Corona. (2)

Latin.—Plautus. (2)

French.—Grammar and reader. (2)

German.—Grammar and reader. (2)

Chemistry.—Stoichiometry and qualitative analysis (laboratory). (4)

JUNIOR CLASS.

FIRST TERM.

History.—Wilhelm Müller's Political History of Recent Times, and lectures. (2)

Philosophy.—Coppée's Logic. (2)

English.—Coppée's English Literature. (4)

French.—Grammar. George Sand: La Mare au Diable. Dumas: Pauline. (2) Or *German.*—Grammar. Bernhardt's Novelletten-Bibliothek, II. (2)

Greek.—Sophocles: Electra. Antiquities. (3)

Latin.—Letters of Cicero and Pliny. (3)

Essays and Original Orations.

Gymnasium. (2)

SECOND TERM.

History.—History of England: Hume. (3)

Philosophy.—Lectures on the outlines of physiological psychology. (2) Political economy. (1)

English.—Earle's Philology of the English Tongue. (2)

French.—Vigny: Le Cachet Rouge. Hugo: La Chute. Dictation. (2) Or *German.*—Buchheim's Prose Composition. Riehl: Culturgeschichtliche Novellen. Freytag: Aus dem Staat Friedrichs des Grossen. Dictation. (2)

Greek.—Aristophanes: Clouds. Æschylus: Prometheus. (3)

Latin.—Persius and Terence. History of Roman literature. (3)

Literature and History. (1)

Essays and Original Orations.

Gymnasium. (2)

SENIOR CLASS.

FIRST TERM.

International Law.—Lectures: Woolsey. (2)

History.—Decline and Fall of the Roman Empire: Gibbon. (3)

Philosophy.—Lectures on the history of ancient and medieval philosophy. (2)

Astronomy.—Young's General Astronomy. (3)

French.—Sadler; Readings in Corneille, Racine, Molière, etc., and contemporary authors. Compositions. Lectures on French literature. (2) Or *German.*—Grammar. Readings in Lessing, Herder, Goethe, Schiller, etc., and contemporary authors. Compositions. Lectures on German literature. (2) Conversation class in both languages optional throughout the year.

Greek.—Plato: Phædrus. Greek philosophy. (2)

Latin.—Lucretius, with lectures. Roman literature. (2)

Essays and Original Orations.

Gymnasium. (2)

SECOND TERM.

Constitutional Law.—Lectures. (1)

History.—History of France. (2)

Philosophy.—Lectures on the history of modern philosophy. (1) Philosophy of history. Lectures. (2)

Christian Evidences.—Lectures. (1)

French.—Readings. Compositions. Lectures in French on modern French authors. (2) Or *German.*—Readings. Compositions. Lectures in German on modern German authors. (2)

Geology.—Lectures. Geikie. (2)

Greek.—Pindar: selected odes. Greek literature. (2)

Latin.—Cicero: De Officiis, with lectures. (2)

Lectures on American and English Literature. (2)

Essays and Original Orations.

Preparation of Thesis.

Gymnasium.

THE LATIN-SCIENTIFIC COURSE.

The Latin-Scientific Course, leading to the degree of Bachelor of Science (B.S.), is based on Latin without Greek.

FRESHMAN CLASS.

FIRST TERM.

Mathematics.—Geometry (Chauvenet completed). (3) Plane trigonometry. (1)

Chemistry.—Lectures. Remsen's Inorganic Chemistry. (4)

German.—Joynes-Meissner's Grammar. Buchheim's Reader. (3)

Latin.—Cicero: De Senectute and De Amicitia. Livy begun. Prose composition. (2)

Physiology and Health.—Lectures. (1)

English.—Rhetoric. (1) Study of Words. (1)

Essays.

Gymnasium. (2)

SECOND TERM.

Mathematics.—Olney's University Algebra, Part III. (3) Plane and spherical trigonometry and mensuration. Use of logarithmic tables. (2)

German.—Grammar. Reader (continued). Bernhardt's Novelletten-Bibliothek, I. (3)

History.—History of Greece. (2) History of Rome. (1) Roman antiquities.

Latin.—Livy (completed). Horace: Odes and Epodes. Composition and prosody. (4)

English.—Rhetoric. (1)

Essays.

Gymnasium. (2)

SOPHOMORE CLASS.

FIRST TERM.

Mathematics.—Analytical geometry: Olney's General Geometry. (4)

Physics.—Lectures. (3)

French.—Whitney's Practical French Grammar. Super's Reader. (2)

German.—Harris's Prose Composition. Bernhardt's Novelletten-Bibliothek, II. (2)

History.—History of Rome. (1) Antiquities.

Latin.—Horace: Satires and Epistles. Composition. (2)

English.—Rhetoric. (1)

Essays.

Gymnasium. (2)

SECOND TERM.

Mathematics.—Differential and integral calculus: Olney. (4)

French.—Grammar. Reader (continued). (2)

German.—Harris. Riehl: Culturgeschichtliche Novellen. Freytag: Aus dem Staat Friedrichs des Grossen. Dictation. (2)

History.—Weber's Outlines of Universal History. (2)

Latin.—Tacitus: Agricola, Germania, and Annals, or Quintilian: Book X. Composition. (3) Antiquities.

English.—Rhetoric. (1)

Essays.

Gymnasium. (2)

JUNIOR CLASS.

FIRST TERM.

History.—Wilhelm Müller's Political History of Recent Times,and lectures. (2)

Philosophy.—Coppée's Logic. (2)

English.—Coppée's English Literature. (4)

French.—Grammar. George Sand: La Mare au Diable. Dumas: Pauline. (2)

German.—Readings in Lessing, Herder, Goethe, Schiller, and contemporary authors. Dictation. Compositions. (2) Conversation class in German optional throughout the year.

Latin.—Letters of Cicero and Pliny. (3)

Essays and Original Orations.

Gymnasium. (2)

SECOND TERM.

History.—History of England: Hume. (3)

Philosophy.—Lectures on the outlines of physiological psychology. (2) Political economy. (1)

English.—Earle's Philology of the English Tongue. (2)

French.—Vigny: Le Cachet Rouge. Hugo: La Chute. Dictation. (2)

German.—Readings (continued). Dictation. Compositions. (2)

Latin. — Persius, Terence. History of Roman literature. (3)

Literature and History. (1)

Essays and Original Orations.

Gymnasium. (2)

SENIOR CLASS.

FIRST TERM.

International Law.—Lectures: Woolsey. (2)

History. — Decline and Fall of the Roman Empire: Gibbon. (3)

Philosophy.—Lectures on the history of ancient and medieval philosophy. (2)

Astronomy.—Young's General Astronomy. (3)

French.—Readings in Corneille, Racine, Molière, etc., and contemporary authors. Lectures on French literature. (2)

German.—Readings (continued). Compositions. Lectures on German literature. (1) Conversation class in both languages optional throughout the year.

Latin.—Lucretius, with lectures. Roman literature. (2)

Essays and Original Orations.

Gymnasium.

SECOND TERM.

Constitutional Law.—Lectures. (1)

History.—History of France. (2)

Philosophy.—Lectures on the history of modern philosophy. (1) Philosophy of history. Lectures. (2)

Christian Evidences.—Lectures. (1)

Geology.—Lectures. Geikie. (2)

Latin.—Cicero: De Officiis, with lectures. (2)

French.—Readings (continued). Compositions. Lectures in French on modern French authors. (2)

German.—Readings (continued). Compositions. Lectures in German on modern German authors. (1)

Lectures on American and English Literature. (2)
Essays and Original Orations.
Preparation of Thesis.
Gymnasium.

COURSE IN SCIENCE AND LETTERS.

The Course in Science and Letters, leading to the Degree of Bachelor of Science (B.S.), is designed for those who wish to pursue both scientific and literary studies without Latin and Greek. These being omitted, extended instruction is given in French and German, History, General Literature, Mathematics and General Science.

FRESHMAN CLASS.

FIRST TERM.

Mathematics.—Geometry (Chauvenet completed). (3) Plane trigonometry. (1)

Chemistry.—Lectures. Remsen's Inorganic Chemistry. (4)

German. — Joynes-Meissner's Grammar. Buchheim's Reader. (3)

Drawing.—Elementary projections, shading and lettering. (2)

Physiology and Health.—Lectures. (1)

English.—Rhetoric. (2) Study of Words. (1)

Essays.

Gymnasium. (2)

SECOND TERM.

Mathematics.—Olney's University Algebra, Part III. (3) Plane and spherical trigonometry and mensuration. Use of logarithmic tables. (2)

Chemistry.—Lectures and laboratory practice. Douglas and Prescott's Qualitative Analysis. (3)

History.—History of Greece. (2). History of Rome. (1)

German.—Grammar. Reader (continued). Bernhardt's Novelletten—Bibliothek, I. (3)

English.—Rhetoric. (2)

Essays.

Gymnasium. (2)

SOPHOMORE CLASS.

FIRST TERM.

Mathematics.—Analytical geometry: Olney's General Geometry. (4)

Physics.—Heat, magnetism, and electricity. Lectures and recitations. (5)

French.—Whitney's Practical French Grammar. Super's Reader. (2)

German.—Harris's Prose Composition. Bernhardt's Novelletten-Bibliothek, II. (2)

History.—History of Rome. (1) Antiquities.

English.—Readings in English classics. (1)

Essays.

Gymnasium. (2)

SECOND TERM.

Mathematics.—Differential and integral calculus. Olney. (4)

Physics.—Sound and light. Lectures and recitations. (3)

Zoölogy.—Lectures. Orton. (2)

English.—Coppée's Rhetoric, with Kellogg's Praxis. (1)

French.—Grammar. Readings (continued). (2)

German.—Harris. Riehl: Culturgeschichtliche Novellen. Freytag: Aus dem Staat Friedrichs des Grossen. (2)

History.—Weber's Outlines of Universal History. (2)

English.—Readings in English classics. (1)

Essays.

Gymnasium. (2)

JUNIOR CLASS.

FIRST TERM.

History.—Wilhelm Müller's Political History of Recent Times, and lectures. (2)

Philosophy.—Coppée's Logic. (2)

English.—Coppée's English Literature. (4)

French.—Grammar. George Sand: La Mare au Diable. Dumas: Pauline. (2)

German.—Readings in Lessing, Herder, Goethe, Schiller, and contemporary authors. Dictation. Compositions. (2) Conversation class in German optional throughout the year.

Zoölogy.—Lectures on biology. (2)

Crystallography.—Lectures, with practical exercises in the determination of crystals. (2)

Essays and Original Orations.

Gymnasium. (2)

SECOND TERM.

History.—History of England: Hume. (3)

Philosophy.—Lectures on the outlines of physiological psychology. (2) Political economy. (1)

English.—Earle's Philology of the English Tongue. (2)

French.—Grammar. Vigny: Le Cachet Rouge. Hugo: La Chute. Dictation. (2)

German.—Lessing, Herder, Goethe, Schiller, Heine, etc. Compositions. (2)

Mineralogy.—Descriptive mineralogy, with practical exercises in the determination of minerals. (3)

Literature and History. (1)

Essays and Original Orations.

Gymnasium. (2)

SENIOR CLASS.

FIRST TERM.

International Law.—Lectures: Woolsey. (2)

History.—Decline and Fall of the Roman Empire. (3)

Philosophy.—Lectures on the history of ancient and medieval philosophy. (2)

Astronomy.—Young's General Astronomy. (3)

French.—Readings in Corneille, Racine, Molière, etc., and contemporary authors. Compositions. Lectures on French Literature. (2)

German.—Readings (continued). Compositions. Lectures on German Literature. (1)

In both languages conversation class optional throughout the year.

Geology. — Williams' Lithology and laboratory practice. (2)

Essays and Original Orations.

Gymnasium.

SECOND TERM.

Constitutional Law.—Lectures. (1)

History.—History of France. (2)

Philosophy.—Lectures on the history of modern philosophy. (1) Philosophy of history. Lectures. (2)

Christian Evidences.—Lectures. (1)

French.—Readings (continued). Compositions. Lectures in French on modern French authors. (2)

German.—Readings (continued). Compositions. Lectures in German on modern German authors. (1)

Geology. — Historic and dynamic geology. LeConte. (3)

Lectures on American and English Literature. (2)

Essays and Original Orations.

Preparation of Thesis.

Gymnasium.

THE SCHOOL OF TECHNOLOGY.

This school includes seven distinct courses:

I. The Course in Civil Engineering.
II. The Course in Mechanical Engineering.
III. The Course in Mining Engineering.
IV. The Shorter Course in Mining.
V. The Course in Electrical Engineering.
VI. The Course in Chemistry.
VII. The Course in Architecture.

These have the same curriculum of studies for the first term of the Freshman year; except that students who propose to take the course in Mechanical Engineering or that in Analytical Chemistry are required to take German. After the first term the student follows the program of the course which he has selected.

FRESHMAN CLASS.

FIRST TERM.

Mathematics.—Chauvenet's Geometry (completed). (3) Plane trigonometry. (1)

Chemistry.—Lectures. Remsen's Inorganic Chemistry. (4)

French.—Whitney's Practical French Grammar. Super's Reader. (3) Or *German.* — Joynes-Meissner's Grammar. Buchheim's Reader. (3)

Drawing.—Free-hand sketching and lettering. (2)

English.—Rhetoric. (2)

Essays.

Physiology and Health.—Lectures. (1)

Gymnasium. (2)

THE COURSE IN CIVIL ENGINEERING.

The special technical studies in this course may be grouped under the heads of Surveying, Applied Mechanics, Road and Railroad Construction, Bridge Design, and Hydraulic and Sanitary Engineering.

The work in Surveying extends over four terms and embraces land surveying, leveling, topography, triangulation, railroad reconnaissance and location, hydrography, and the elements of geodesy. A large equipment of transits, levels, and other surveying tools affords students the opportunity of becoming familiar with the instruments of different manufacturers. Much time is devoted to practice in the field and drafting room, each student being required to become proficient in the use of instruments, in taking field notes, and in map-drawing. Particular attention is paid to the execution of topographical surveys and maps by the best modern methods. Railroad maps and profiles are made from actual field location. During the Senior year there is done secondary triangulation work of a high order of precision.

The work in Applied Mechanics comprises the strength and elasticity of materials, the theory of the equilibrium of arches, roofs and bridges, that part of the mechanics of machinery which relates to locomotives and hoisting machines, and the theory of hydraulics and hydraulic motors. Here the theoretical principles are illustrated by examples and problems taken as far as possible from actual engineering practice and a special report is required from each student on the testing machines of the Bethlehem Iron Company.

The course in Construction familiarizes the student with the qualities of materials used in engineering structures, with methods of preservation and testing, with masonry and foundations, and with the building and maintenance of roads and railroads. All the standard tests for hydraulic cements and mortars are made by each student.

The course in Bridge Design is preceded by the theory of computation of stresses by both analytical and graphic methods. Starting with the specifications for a first-class iron highway or railroad bridge, each student then makes the full computations, designs, working drawings and bills of material for a plate girder, a lattice girder, and a pin-connected truss bridge. The weight of the designed bridge is finally determined and compared with the dead load assumed for the calculations. The drawings are made and dimensioned in the same manner as in the drafting office of a bridge company. In connection with this course visits of inspection to bridges in the vicinity are regularly made.

The work in Hydraulic and Sanitary Engineering embraces the study of systems of water supply, the collection, purification and distribution of water, the combined and the separate systems of sewerage, the methods for the disposal of sewage, and the best practice for the drainage and ventilation of houses. The hydraulic laboratory in the University Park affords opportunity for experiments on the actual measurement of water by means of weirs and orifices, and the testing of hydraulic motors.

Besides these special studies there is a course in astronomy, which includes practical work in the observatory. The study of English, and of French or German, is continued, and instruction is given during four terms in crystallography, mineralogy, lithology, and geology.

The student who completes all the studies of this course will receive the degree of Civil Engineer (C.E).

FRESHMAN CLASS.

FIRST TERM.

See page 64.

SECOND TERM.

Mathematics.—Olney's University Algebra, Part III. (3) Plane and spherical trigonometry and mensuration. Use of logarithmic tables. (2)

French.—Grammar and reader (continued). (3) Or *German.*—Grammar and reader (continued). Bernhardt's Novelletten-Bibliothek, I. (3)

Construction.—Materials. Masonry. Carpentry. Roads and pavements. Sketches of structures. (2)

Drawing.—Descriptive geometry and isometric drawing. Tracings. Warren's Elementary Projection Drawing. (3)

English.—Rhetoric. (2)

Essays.

Gymnasium. (2)

SOPHOMORE CLASS.

FIRST TERM.

Mathematics.—Analytical geometry: Olney's General Geometry. (4)

Physics.—Heat, magnetism, and electricity. Lectures and recitations. (5)

French.—Grammar. George Sand: La Mare au Diable. Dumas: Pauline. (2) Or *German.* — Grammar. Bernhardt's Novelletten-Bibliothek, II. (2)

Drawing.—Architectural drawing. Plans of piers and arches. Problems in stone cutting. (4)

English.—Readings in English classics. (1)

Essays.

Gymnasium. (2)

SECOND TERM.

Mathematics.—Differential and integral calculus: Olney and Courtenay. (4)

Physics.—Sound and light. Lectures and recitations. (3)

French.—Grammar. George Sand: Le Cachet Rouge. Hugo: La Chute. Dictation. (2) Or *German.*—Grammar. Riehl: Culturgeschichtliche Novellen. Freytag: Aus dem Staat Friedrichs des Grossen. Dictation. (2)

Mechanics.—Theory of motion, statics, energy, center of gravity, moment of inertia, and general equations of motion. (4)

Surveying.—Theory and use of compass, level, and transit. Surveys and maps of farms. Leveling. (3)

English.—Readings in English classics. (1)

Essays.

Gymnasium. (2)

JUNIOR CLASS.

FIRST TERM.

Mathematics.—Courtenay's Calculus, and Wood's Analytical Mechanics. (2)

French.—Corneille, Racine, Molière, Hugo, etc. Dictation. Compositions. (2) Or *German.*—Lessing, Herder, Goethe, Schiller, Heine, etc. Dictation. Compositions. (2) Conversation class in both languages optional throughout the year.

Surveying.—Triangulation. Topographical surveying with transit and stadia. Use of plane table. Topographical map. (4)

Strength of Materials.—Elasticity and strength of wood, stone, and metals. Theory of beams, columns, and shafts. Reports on the testing of materials. (4)

Construction.—Foundations. Specifications and estimates. Reports on structures. Tests of cements. (2)

Crystallography.—Lectures, with practical exercises in the determination of crystals. (2)

Essays and Original Orations.

Gymnasium. (2)

SECOND TERM.

French.—Readings. Compositions. Lectures on French literature. (2) Or *German.*—Readings. Compositions. Lectures on German literature. (2)

Surveying.—Theory of railroad curves. Railroad reconnaissance and location. Survey of a line, with profile, map, and estimate of cost. Lectures on construction and maintenance. (4)

Roofs and Bridges.—Theory and calculations of strains in roof and bridge trusses. Graphic statics. (5)

Construction.—Retaining walls, masonry dams and stone arches. Designs and estimates. (2)

Mineralogy.—Descriptive mineralogy, with practical exercises in the determination of minerals. (3)

Literature and History. (1)

Gymnasium. (2)

SENIOR CLASS.

FIRST TERM.

Astronomy.—Young's General Astronomy. (3)

Bridges.—Suspension, continuous, and cantilever bridges. Design of plate girders and riveted bridges, with working drawings. (6)

Surveying.—Use of solar transit and sextant. Precise triangulation. Elements of geodesy. Determination of the systematic errors of instruments. (3)

Mechanics of Machinery.—Pile drivers, cranes and elevators. The mechanics of the locomotive. (2)

Geology.—Williams' Lithology, with practical exercises in determining rocks. (2)

Gymnasium.

SECOND TERM.

Astronomy.—Doolittle's Practical Astronomy, with observatory work. (2)

Bridges.—Design of pin-connected bridges, with working drawings and estimates. (3)

Hydraulics.—Hydrostatics. Efflux of water from orifices and flow in pipes and rivers. Hydraulic motors. Practical work in the hydraulic laboratory. (2)

Hydraulic and Sanitary Engineering.—Collection, purification and distribution of water. Systems of water supply. The combined and the separate system of sewerage. Disposal of sewage. House drainage. (4)

Geology.—Historic and dynamic. Geikie. (2)

Lectures on American and English Literature. (2)

Christian Evidences.—Lectures. (1)

Preparation of Thesis.

Gymnasium.

THE COURSE IN MECHANICAL ENGINEERING.

The object of this course is the study of the Science of Machines. The principal subjects taught are: The nature, equivalence, and analysis of mechanisms, the mechanics or theory of the principal classes or types of machinery, Mechanical Technology, and the principles and practice of Machine Design.

That the students may obtain the practical engineering data which they will most need when beginning their work as mechanical engineers they are required to pursue a course of Shop Instruction which does not necessarily involve manual labor and manipulation of tools, but is principally devoted to familiarizing them with those points in pattern-making, moulding, forging, fitting and finishing, which they need to know as designers of machinery. Particular attention is therefore directed to the forms and sizes of machine parts that can be readily constructed in the various workshops, to the time that it takes to perform, and the order of, the various operations, to the dimensions most needed by workmen and to the various devices for increasing the accuracy of the work, durability of the parts, and convenience of manipulation. This involves acquaintance with the processes and machinery of the workshops, but it is the foreman's and superintendent's knowledge which is required rather than the manual dexterity and skill of the workman and tool-hand. The acquirements peculiar to the latter are by no means despised and the students are encouraged to familiarize themselves therewith during leisure hours, but manual work in the shops forms no regular part of the course. On the contrary, the student enters the shop with hands and mind free to examine all processes, operations, and machinery, and is ready at the call of the teacher to witness any operation of special interest. Provided with note-book, pencil, calipers, and measuring rule, the student sketches the most important parts of the various machine-tools, notes down the successive steps of each of the important shop-processes as illustrated by the pieces operated upon, and follows the pieces of work through the shops from the pig or merchant form to the finished machine.

That the students may learn to observe carefully and be trained to think and observe for themselves in these matters, there is required of them a full description of the various processes, operations, and tools involved in the production of each one of a series of properly graded examples of patterns, castings, forgings, and finished pieces, which are not being constructed in the shops at the time and the blue prints for which have been given to them on entering the shops. The student's work is directed not only by these drawings and by the printed program given him at the start, but also personally by a teacher, who accompanies him into the shops, gives necessary explanations, and tests the extent and accuracy of his knowledge by examining the sketches and notes and by frequent questioning. Finally the results of the observations and the sketches are embodied in a memoir.

During the course there are frequent visits of inspection to the Bethlehem Iron Company, the L. V. R. R. Shops at Easton, and other engineering works both in and out of town, with special reference to such subjects as machine elements, prime movers, machinery for lifting, handling and transporting, and machinery for changing the form and size of materials. It is intended that each of these excursions shall have some definite purpose in view which must be fully reported by the students. These visits are also made the occasion for constant practice in the free-hand sketching of machinery.

The instruction in Machine Design begins with second term of the Freshman year and is continued throughout the course. At first tracings and blue prints of good examples of machine drawings are made. A thorough drill in projection drawing follows; in this work free-hand sketches are first made, and measurements taken, of machine pieces; these sketches are then converted into full-size working drawings. Then there is considerable practice in the interpretation of such drawings, and general views of lathes, planers, drills, and shapers are made from the drawings of the details. This is followed by difficult projections and intersections and exercises in the empirical proportioning of machine parts. Both empirical and rational formulas are used to determine the dimensions of fastenings, bearings, rotating and sliding pieces, belt and toothed gearing, levers and connecting rods, the data being given as they would arise in practice and the drawings made full size. During the Junior year the class takes up the design of a high-speed steam engine, every dimension being determined by the students and complete drawings made. During the Senior year the students undertake the calculations, estimates, and working drawings involved in the design of a simple but complete machine, each student being engaged upon a different machine. From the finished drawings of each machine tracings are made and then blue prints taken for distribution among the other members of the class. In the case of the machines and of the engine the general plan or arrangement will be given to the students in the form of rough sketches, photographs or woodcuts. In the last term the students are expected to make original designs for simple machinery, whose object has been fully explained. Throughout the course the work in the draughting-room is carried on as nearly as possible like that of an engineering establishment, and special attention is paid to methods of expediting the work of calculation by means of simple formulas, tables, and diagrams.

All the students in this course are required to study German.

The graduates in this course will receive the degree of Mechanical Engineer (M.E.).

FRESHMAN CLASS.

FIRST TERM.

See page 64.

SECOND TERM.

Mathematics.—Olney's University Algebra, Part III. (3) Plane and spherical trigonometry and mensuration. Use of logarithmic tables. (2)

German.—Grammar and reader (continued). Bernhardt's Novelletten-Bibliothek, I. (3)

Drawing and Machine Design.—Tracings and blue prints. Sketches and working drawings of machine pieces. Interpretation of machine drawing by isometric sketches. General views from given details. Sections of stub ends and valve passages. Intersection of boiler flues. Empirical proportioning of machine parts. (5)

English.—Rhetoric. (2)

Essays.

Gymnasium. (2)

SOPHOMORE CLASS.

FIRST TERM.

Mathematics.—Analytical geometry: Olney's General Geometry. (4)

Physics.—Heat, magnetism, and electricity. Lectures and recitations. (5)

Machine Design.—Proportioning of such machine parts as come under the head of fastenings, bearings, rotating and sliding pieces, belt and toothed gearing, levers, and connecting rods. (2)

Visits of Inspection.—Examination and sketching of principal machine parts in the shops of the vicinity. (2)

German.—Grammar. Bernhardt's Novelletten-Bibliothek, II. (2)

English.—Readings in English classics. (1)

Essays.

Gymnasium. (2)

SECOND TERM.

Mathematics.—Differential and integral calculus: Olney and Courtenay. (4)

Physics.—Sound and Light. Lectures and recitations. (3)

German.—Grammar. Riehl: Culturgeschichtliche Novellen. Freytag: Aus dem Staat Friedrichs des Grossen. Dictation. (2)

Mechanics.—Theory of motion, statics, energy, center of gravity, moment of inertia, and general equations of motion. (4)

Steam Engine.—Holmes' Steam Engine. (3)

English.—Readings in English classics. (1)

Essays.

Gymnasium. (2)

JUNIOR CLASS.

FIRST TERM.

Mathematics.—Courtenay's Calculus and Wood's Analytical Mechanics. (2)

German.—Lessing, Herder, Goethe, Schiller, Heine, etc. Dictation. Compositions. (2) Conversation class optional throughout the year.

Mechanical Technology.—Shop instruction. Examination of the processes and appliances involved in pattern-making, moulding, forging, fitting, and finishing, with sketches and reports. (7)

Boilers.—Wilson. Strength, construction, and wear and tear of boilers. (1)

Strength of Materials.—Elasticity and strength of wood, stone, and metals. Theory of beams, columns, and shafts. Reports on experimental tests. (4)

Essays and Original Orations.

Gymnasium. (2)

SECOND TERM.

German.—Readings. Compositions. Lectures on German literature. (2)

Kinematics of Machinery.—Reuleaux. Nature and equivalence of mechanisms. (3)

Machine Design.—Calculations and working drawings for a high-speed steam engine. (5)

Metallurgy.—Metallurgical processes. Furnaces. Refractory building materials. Combustion. Natural and artificial fuels. Metallurgy of iron. (4)

Machinery of Transmission.—Weisbach-Herrmann. (2)

Literature and History. (1)

Gymnasium. (2)

SENIOR CLASS.

FIRST TERM.

Thermodynamics. — General principles; application to steam engines and air compressors. (3)

Graphical Statics.—Graphical analysis of roof trusses and girders. (2)

Machine Design.—Calculations and working drawings for hoisting, pumping, and metal-working machinery. (4)

Kinematics.—Diagrams of the changes of position, speed and acceleration in mechanisms. Link and valve motions. Quick return motions. Parallel motions. Laying out of cams. (3)

Mechanics of Machinery.—Weisbach-Herrmann. Hoisting machinery, accumulators, cranes, and locomotives. Graphical statics of mechanisms. (4)

Gymnasium.

SECOND TERM.

Mechanics of Machinery.—Weisbach-Herrmann. Pumps, pumping engines, blowing engines, compressors, and fans. (4)

Machine Design.—Original designs. (5)

Hydraulics.—Hydrostatics. Flow of water in pipes and channels. Hydraulic motors. Practical work in the hydraulic laboratory. (2)

Measurement of Power.—Indicating of steam engines; determination of evaporative efficiency of boilers; dynamometer experiments. (1)

Lectures on American and English Literature. (2)

Christian Evidences.—Lectures. (1)

Preparation of Thesis.

Gymnasium.

THE COURSES IN MINING ENGINEERING.

These courses aim to fit the student for practical work in either of the branches of mining, metallurgy, metallurgical chemistry, or geology. On account of the great number and scope of the studies necessary to the attainment of the degree of Engineer of Mines (E.M.), which includes that of Metallurgist, five years are required. At the end of the fourth year the student will have completed a course similar to that leading to the scientific degree in other institutions, and will receive the degree of Bachelor of Science (B.S.). On completing the first year, those who desire to practice mining alone are provided with a special course leading to the degree of Bachelor of Science (B.S.) in mining. The following program of subjects and studies shows the requirements for the degree of Engineer of Mines.

Modern Languages.—Although the option of studying French or German lies with the student, it may be well to note that the current literature of the subjects taught in these courses is more abundant in the latter language.

Drawing and Construction.—The course in machine design begins in the second term of Freshman year with tracings of good examples of machine drawings; then follow the interpretation of such drawings, and the making of general views of machines from detailed sketches; exercises in projection drawing from the same, and the proportioning of simple tools and machines. In Sophomore year the student becomes acquainted with the arrangement and details of metallurgical plant and in Senior year he designs the same. The post-graduate, during the entire year, becomes acquainted with and designs mining plant. The field work in mining and geological surveying is followed by map construction from field notes. Practice in mining and metallurgical construction is also afforded by the projects.

CHEMISTRY. — The course in theoretical and applied chemistry extends over three years and includes work in wet and dry assaying of all the important ores and metallurgical products met with in actual practice, combined with the working of stoichiometric problems and the study of chemical philosophy. The practical work is that required for a metallurgical chemist or assayer.

With moderate care the expenses in this department need not exceed $120.

MINERALOGY.—This subject is divided into two courses. In the first course, after a short exposition of the laws of crystallography and a description of crystalline forms, practical exercises are held in the determination of simple and complex crystals, in which the student is taught to identify the various crystalline forms observed in minerals by the aid of models and of actual crystals, and with the use of the application goniometer. The second course includes the subjects of physical, descriptive, and determinative mineralogy. As in the first course, the greater part of the time is devoted to practical exercises, which, in this course, have for their object the determination of minerals. Each student is thus enabled to become familiar with the more common minerals by the actual handling of several hundred specimens, with the facility of making such tests as will not injure them. The presence of one or more instructors during each exercise permits the student to make frequent reports of his determinations, and to receive much instruction as to the characteristics of the minerals. The knowledge thus acquired can be supplemented by visits to the museum.

The course in blowpipe analysis may be considered as auxiliary to the practical exercises in determinative mineralogy. In the latter the student is urged to rely chiefly on physical tests; in the former he is required to determine minerals by the aid of the blowpipe.

The mineralogical laboratory offers facilities for an advanced course in crystallography and in physical and microscopic mineralogy to a few students who may receive permission to pursue such a course.

GEOLOGY.—This subject is studied with special reference to the needs of the mining engineer. Within a radius of twenty miles the student meets and becomes acquainted with the rocks of the archæan, the palæozoic, and the mesozoic formations, and makes geological maps from his own field notes, paying attention to the lithological characters of the formations, as they are mainly non-fossiliferous south of the Blue Ridge. An extended practical course in lithology familiarizes the student with the rocks of importance to the mining engineer and enables him to determine them by sight. There are over 2000 specimens in the collection, embracing all the known species. The course in historic geology is illustrated by a cabinet of typical specimens. The course in economic geology supplements the above work by familiarizing the student with the geological horizon of all the valuable constituents of the earth's crust and the theories of their formation. As Bethlehem is near the center of the "extra-moraine" drift, exceptional facilities are afforded for the study of pleistocene geology in Eastern Pennsylvania.

ASTRONOMY.—After studying the theory of the subject two-thirds of the year are devoted to practical work in the observatory.

APPLIED MECHANICS.—This embraces hydraulics, a study of the steam engine, and the mechanics of machines employed in mining and metallurgy.

SURVEYING.—A course extending over three terms offers practice in land, mine, and geological surveying, leveling, topography, triangulation, railroad reconnaissance and location, and the use of the solar transit. It also includes practical work in drawing and map construction.

METALLURGY.—There are two courses of, together, about one hundred and forty lectures upon this subject, which extend throughout a year. In these the chief object kept in view is a clear presentation of the principles involved in the various metallurgical processes, looked upon as the application to practice of the laws of chemistry, physics, and mechanics. This is followed, in the case of each process, by a description of the more important examples of the plant and of the methods of conducting the process, and by indications concerning its economic features. In order to ensure that the student shall understand the fundamental principles of metallurgy, and shall become so familiar with them as to be able readily to apply them, he is required to solve a series of problems in which these principles are involved. Many of the problems are such as are likely to present themselves to the metallurgist in his current practice.

The metallurgical laboratory affords opportunity for special investigations in subjects connected with metallurgy to such advanced students as are competent to conduct them.

MINING.—This subject is covered by three courses. The first begins with the application of economic geology to the needs of the engineer, so that he can study and value mining properties, locate appropriately the necessary plant, and calculate the cost of production. It includes the discussion of faults and the means of finding faulted bodies, with practical problems. The subjects of blasting, timbering, and winning deposits are applied to actual cases, as tunnel-driving, etc., and problems from practical data are solved by the students. The second course covers the subjects of underground and surface haulage; loading, unloading, and stocking ores; pumping; ventilation; hygiene and mining law. A series of problems is given in each of these subjects to cover cases that meet the engineer in ordinary practice. The third course treats of the mechanical preparation of ores by the wet, dry, or magnetic methods, and especially of the preparation of anthracite coal.

The location of the University in the vicinity of the iron works of the Lehigh Valley, and especially of the extensive establishment of the Bethlehem Iron Company, affords unusual facilities for the practical study of iron metallurgy. The processes for the manufacture of spelter and oxide of zinc may be studied at the Bethlehem Zinc Works. The facilities for the practical study of mining and economic geology are not excelled by those of any other institution in the country. The zinc mines at Friedensville, the paint ores of the Marcellus formation, and the brown hematite and slate deposits of the Lehigh Valley are in the immediate vicinity, while within easy reach by rail are the semi-bituminous and anthracite coal fields, the block and fossil iron ores of the Clinton measures, the iron mines at Cornwall, Pennsylvania, and the iron and zinc mines of New Jersey; together affording examples of nearly all the methods of winning and dressing valuable deposits. Numerous visits of inspection are made in connection with the work of the course, to familiarize the student with metallurgical and mining processes and afford data for practical examples and projects.

THE COURSE IN MINING ENGINEERING.

This course is arranged so that the subjects which prepare the student for practice in the field of metallurgy shall be completed at the end of four years, when the graduate will receive the degree of Bachelor of Science in Metallurgy (B.S.). By remaining a year longer, and taking the subjects laid down for the post-graduate year, the graduate in the course may obtain the degree of Engineer of Mines (E.M.).

FRESHMAN CLASS.

FIRST TERM.

See page 64.

SECOND TERM.

Mathematics.—Olney's University Algebra, Part III. (3) Plane and spherical trigonometry and mensuration. Use of logarithmic tables. (2)

French.—Grammar and reader (continued). (3) *German.*—Grammar and reader (continued). Bernhardt's Novelletten-Bibliothek, I. (3)

Drawing.—Tracings and blue prints. Sketches and working drawings of machine pieces. Interpretation of drawings by isometric sketches. General views from given details. Sections of simple construction. Intersections of spheres, cones, cylinders, etc., illustrated from examples of mining and metallurgical plant. Graphical problems illustrating the direction and extent of throw in faults. (5)

English.—Rhetoric. (2)

Essays.

Gymnasium. (2)

SOPHOMORE CLASS.

FIRST TERM.

Mathematics. — Analytical geometry: Olney's General Geometry. (4)

Physics.—Heat, magnetism, and electricity. Lectures and recitations. (5)

French.—Grammar. George Sand: La Mare au Diable. Dumas: Pauline. (2) Or *German.*—Grammar. Bernhardt's Novelletten-Bibliothek, II. (2)

Drawing.—General views of metallurgical plant and detailed sketches. (2)

Surveying.—Theory and use of the level, compass, and transit. Surveys and maps of farms.

English.—Readings in English classics. (1)

Essays.

Gymnasium. (2)

SECOND TERM.

Mathematics.—Differential and integral calculus: Olney and Courtenay. (4)

Mechanics.—Theory of motion, statics, energy, center of gravity, moment of inertia, and general equations of motion. (4)

Chemistry.—Lectures and laboratory practice. Douglas and Prescott's Qualitative Analysis. (4)

Stoichiometry. (2)

French.—Grammar. Vigny: Le Cachet Rouge. Hugo: La Chute. Dictation. (2) Or *German.*—Grammar. Riehl: Culturgeschichtliche Novellen. Freytag: Aus dem Staat Friedrichs des Grossen. Dictation. (2)

English.—Readings in English classics. (1)

Essays.

Gymnasium. (2)

JUNIOR CLASS.

FIRST TERM.

Mathematics.—Courtenay's Calculus and Wood's Analytical Mechanics. (2)

Strength of Materials.—Elasticity and strength of wood, stone, and metals. Theory of beams, columns, and shafts. Reports on the testing of materials. (4)

Crystallography.—Lectures, with practical exercises in the determination of crystals. (2)

Assaying.—Including the assay by the dry methods of gold, silver, antimony, lead, iron, and tin ores, coal, and gold and silver bullion. Laboratory work. Ricketts. (3)

Chemical Philosophy. — Tilden. Chemical calculations. Whiteley. (3)

French.—Corneille, Racine, Molière, Hugo, etc. Dictation. Compositions. (2) Or *German.* — Lessing, Herder, Goethe, Schiller, Heine, etc. Dictation. Compositions. (2)

Conversation class in both languages optional throughout the year.

Essays and Original Orations.

Gymnasium. (2)

SECOND TERM.

Metallurgy.—Metallurgical processes. Furnaces. Refractory building materials. Combustion. Natural and artificial fuels. Metallurgy of iron. (4)

Mineralogy.—Descriptive mineralogy, with practical exercises in the determination of minerals: E. S. Dana. (3)

Blow-Pipe Analysis.—Lectures, with practice. Plattner, Brush, or Nason and Chandler. (1)

Chemistry.—Fresenius' Quantitative Analysis. (4) The following analyses are executed by the student:

1. Iron wire (Fe).
2. Copper ore (Cu).
3. Silver coin (Au, Ag, Pb, Cu).
4. Zinc ore (Zn). By both gravimetric and volumetric methods.
5. Bronze (Cu, Sn, Zn, Pb).
6. Spiegeleisen (Mn).
7. Lead ore (PbS).
8. Ilmenite (TiO_2).
9. Iron ore (complete analysis).
10. Limestone (complete analysis).
11. Coal (volatile matter, fixed carbon, ash, H_2O, S, P).

Steam Engine.—Holmes' Steam Engine. (3)

French.—Readings. Compositions. Lectures on French literature. (2) Or *German.*—Readings. Compositions. Lectures on German literature. (2)

Literature and History.

Gymnasium. (2)

SENIOR CLASS.

FIRST TERM.

Metallurgy.—Of copper, lead, silver, gold, etc. (5)

Blow-Pipe Analysis.—Practice. (1)

Lithology.—Williams' Lithology, with practical exercises in determining rocks. (3)

Mechanics of Machinery.—Herrmann-Smith. The graphical statics of mechanisms. (2)

Chemistry. — Quantitative analysis: laboratory work: Fresenius. (3) The following analyses are executed by the student:

12. Slag (complete analysis).
13. Pig iron (complete analysis).
14. Carbon in steel (volumetric).
15. Nickel ore (Ni, Co).
16. Gas analysis.

Graphical Statics.—Graphical analysis of roof trusses and girders. (2)

Gymnasium.

SECOND TERM.

Mining.—Prospecting. Economic geology. Boring. Valuation of property. Methods of mining. Lectures. Williams. (3) Mechanical preparation of ores. Coal washing. Lectures. (2)

Drawing.—Designing of furnaces and other metallurgical plant. (2)

Mechanics of Machinery. — Hoisting machinery, accumulators, pumps, pumping-engines, blowing-engines, compressors, and fans. (4)

Hydraulics.—Hydrostatics. Flow of water in pipes and channels. Hydraulic motors. Practical work in the hydraulic laboratory. (2)

Lectures on American and English Literature. (2)

Christian Evidences.—Lectures. (1)

Preparation of Thesis.

Gymnasium.

POST-GRADUATE YEAR.

FIRST TERM.

Mining.—Underground transportation. Hoisting, drainage, and pumping. Ventilation and lighting. Hygiene of mines. Mining law. Lectures. (4)

Geology.—General geological definitions and principles. Dynamic geology. Le Conte. (2)

Drawing.—General views of mining plant and detailed sketches. (2)

Surveying.—Mine survey. Theory and practice, with construction of mine maps. Tunneling and shaft location. (2)

Astronomy.—Young's General Astronomy. (3)

Surveying.—Triangulation. Leveling. Topographical surveys with transit and stadia. Topographical maps. (4)

SECOND TERM.

Mining.—Timbering and walling. Support of excavations. Tunneling. Lectures. (2)

Geology.—Historic geology. Le Conte. (2)

Projects.—In geology and mining.

Surveying.—Geological survey: mapping and cross-sectioning. (2)

Drawing.—Designing of mining plant. (2)

Surveying.—Theory of railroad curves. Railroad reconnaissance and location. Survey of a line, with profile, map and estimate of cost. Lectures on construction and maintenance. (4)

Astronomy.—Doolittle's Practical Astronomy, with observatory work. (2)

Preparation of Thesis.

THE SHORTER COURSE IN MINING.

This course is designed so that the student who desires to pursue the practice of mining and ore-dressing, and who does not wish to take the full course, may be prepared for practice in four years, receiving the degree of Bachelor of Science in Mining (B.S.).

This course is identical with the preceding up to the end of the Freshman year.

SOPHOMORE CLASS.

FIRST TERM.

Mathematics.—Analytical geometry: Olney's General Geometry. (4)

Mining Technology.—Kinds and systems of timbering. Details of haulage and hoisting plant. Freehand, isometric, and detailed drawings. (5)

Surveying.—Theory and use of compass, level, and transit. Surveys and maps of farms. (2)

French.—Grammar. George Sand: La Mare au Diable. Dumas: Pauline. (2) Or *German.*—Grammar. Bernhardt's Novelletten-Bibliothek, II. (2)

Crystallography.—Lectures, with practical exercises in the determination of crystals. (2)

English.—Readings in English classics. (1)

Essays.

Gymnasium. (2)

SECOND TERM.

Mathematics.—Differential and integral calculus: Olney and Courtenay. (4)

Mechanics.—Theory of motion, statics, energy, center of gravity, moment of inertia, and general equations of motion. (4)

Chemistry.—Lectures and laboratory practice. Douglas and Prescott's Qualitative Analysis. (4)

Mineralogy.—Descriptive mineralogy, with practical exercises in the determination of minerals: E. S. Dana. (3)

French.—Grammar. Vigny: Le Cachet Rouge. Hugo: La Chute. Dictation. (2) Or *German.*—Grammar. Riehl: Culturgeschichtliche Novellen. Freytag: Aus dem Staat Friedrichs des Grossen. Dictation. (2)

English.—Readings in English classics. (1)

Essays.

Gymnasium. (2)

JUNIOR CLASS.

FIRST TERM.

Mathematics.—Courtenay's Calculus and Wood's Analytical Mechanics. (2)

Strength of Materials.—Elasticity and strength of wood, stone, and metals. Theory of beams, columns, and shafts. Reports on the testing of materials. (4)

Geology.—General geological definitions and principles. Dynamic geology. Le Conte. (2)

Lithology.—Williams' Lithology, with practical exercises in determining rocks. (3)

Surveying.—Triangulation. Leveling. Topographical surveys with transit and stadia. Use of plane table. Topographical map. (4)

French.—Corneille, Racine, Molière, Hugo, etc. Dictation. Compositions. (2) Or *German.*—Lessing, Herder, Goethe, Schiller, Heine, etc. Dictation. Compositions. (2) Conversation class in both languages optional throughout the year.

Essays and Original Orations.

Gymnasium. (2)

SECOND TERM.

Geology.—Historic geology. Lectures. LeConte. Dana. (2)

Mining.—Prospecting. Economic geology. Boring. Valuation of property. System of mining. Lectures. Williams. (3)

Steam Engine.—Holmes' Steam Engine. (3)

Surveying.—Theory of railroad curves. Railroad reconnaissance and location. Survey of a line, with profile, map, and estimate of cost. Lectures on construction and maintenance. (4)

Drawing.—General views of mining plant and detailed sketches. (2)

French.—Readings. Compositions. Lectures on French literature. (2) Or *German.*—Readings. Compositions. Lectures on German literature. (2)

Literature and History.

Gymnasium. (2)

SENIOR CLASS.

FIRST TERM.

Mining.—Underground transportation. Hoisting, drainage, and pumping. Ventilation and lighting. Hygiene of mines. Mining law. Lectures. (4)

Graphical Statics.—Graphical analysis of roof-trusses and girders. (2)

Astronomy.—Young's General Astronomy. (3)

Surveying.—Mine survey. Theory and practice, with construction of mine maps. (2)

Use of solar transit and sextant. Precise triangulation. Elements of geodesy. Determination of the systematic errors of instruments. (3)

Assaying.—Including the assay by the dry methods of gold, silver, antimony, lead, iron, and tin ores, coal, and gold and silver bullion. Laboratory work. Ricketts. (3)

Gymnasium.

SECOND TERM.

Mining.—Timbering and walling. Support of excavations. Tunneling. Lectures. (2) Mechanical preparation of ores. Coal washing. (2)

Projects.—In mining. Designing of mining plant. (3)

Blow-Pipe Analysis.—Lectures, with practice. Plattner, Brush, or Nason and Chandler. (1)

Surveying.—Geological survey: mapping and cross-sectioning. (2)

Hydraulics.—Hydrostatics. Flow of water in pipes and channels. Hydraulic motors. Practical work in the hydraulic laboratory. (2)

Lectures on American and English Literature. (2)

Christian Evidences.—Lectures. (1)

Preparation of Thesis.

Gymnasium.

POST-GRADUATE YEAR.

Students who have completed the last course may obtain the degree of Engineer of Mines (E.M.) by one year's post-graduate work, though it is desired that all who intend taking that degree shall pursue the regular course, first given.

FIRST TERM.

Metallurgy.—Of copper, lead, silver, gold, etc. (5)

Blow-Pipe Analysis.—Practice. (1)

Chemistry.—Quantitative analysis: laboratory work: Fresenius. (3) The following analyses are executed by the student:

1. Iron wire (Fe).
2. Copper ore (Cu).
3. Silver coin (Au, Ag, Pb, Cu).
4. Zinc ore (Zn). By both volumetric and gravimetric methods.
5. Bronze (Cu, Sn, Zn, Pb).
6. Spiegeleisen (Mn).
7. Lead ore (PbS).

Mechanics of Machinery.—Herrmann-Smith. The graphical statics of mechanisms. (2)

Chemical Philosophy. — Tilden. Chemical calculations. Whiteley. (3)

Drawing.—General views of metallurgical plant and detailed sketches. (2)

SECOND TERM.

Metallurgy.—Metallurgical processes. Furnaces. Refractory building materials. Combustion. Natural and artificial fuels. Metallurgy of iron. (4)

Chemistry.—Fresenius' Quantitative Analysis. (4) The following analyses are executed by the student:

8. Ilmenite (TiO_2).
9. Iron ore (complete analysis).
10. Limestone (complete analysis).
11. Coal (volatile matter, fixed carbon, ash, H_2O, S, P).
12. Slag (complete analysis).
13. Pig iron (complete analysis).
14. Carbon in steel (volumetric).
15. Nickel ore (Ni, Co).
16. Gas analysis.

Drawing.—Designing of furnaces and other metallurgical plant. (2)

Mechanics of Machinery.—Hoisting machinery, accumulators, pumps, pumping-engines, blowing-engines, compressors, and fans. (4)

Preparation of Thesis.

THE COURSE IN PHYSICS AND ELECTRICAL ENGINEERING.

In the arrangement of the details of this new course the object has been to provide for those who seek to fit themselves as Electrical Engineers a preliminary training as complete and broad as that given to the members of the other schools. The requirements for admission, the mathematical and English studies, the modern languages and other outside branches are the same as those in the other technical courses. To these have been added such portions of the Mechanical Engineering Course, with which this course is most closely allied, as are necessary to give the student a general but sufficiently accurate knowledge of machinery.

This preparation joined to the unusually full development of Physics—and especially of Electricity—will, it is thought, make a course sufficiently comprehensive and thorough for the proper training of candidates for this degree. The great success attending the large majority of the young men who have taken the one year's course in Electricity, in their subsequent electrical work, warrants the belief that this broader and more extended course will attain its object.

The main feature of this new course is the prominence given to the subject of Physics. This extends through three years, and while Electricity is specially developed the other branches, Elementary Mechanics, Heat and Light, are fully provided for. The opportunity is thus given to any one who wishes to acquire a more extensive knowledge of Physics than the University curriculum has heretofore offered. The student is well drilled in the theory by means of lectures and recitations, which carefully cover the whole subject, and he is required to go over the ground himself in the best of all schools—the working laboratory. Enough of work on each topic is given him to render him familiar with his subject. Much prominence is given to work that brings out the resources of the student himself, such as the construction of instruments and original investigation. He is encouraged to this and a regular portion of his time is set apart for this object.

It will be seen from the preceding statement that this course offers two great advantages: the thorough and extensive training of those intending to take part in the great development of Electric Science in the industrial field now going on and the facilities offered to those who wish to take a four years' course specially devoted to the whole branch of Physics.

The practical work of the Physical Laboratory is too extensive to allow of full details being given in the following arrangement of the course. The more important subjects developed may be mentioned here. In Mechanics, exact measurements, specific gravity, barometric leveling. In Heat, calorimetry and hygrometry. In Light, testing of optical instruments, spectroscopic analysis and photometry. In Magnetism, study of laws of force, determination of moments of magnets and of horizontal components of intensity of earth's magnetism in absolute units. In Meteorology, observations for several months as taken in the U. S. Signal Service stations, with all the usual corrections and reductions; construction of charts; mapping curves; reports, etc. In Electricity, management of batteries, construction of instruments, electrical measurements, electrolysis and relation of electrical currents to heat and mechanical work; practical running and care and tests of dynamos for efficiency, etc.; electric lighting, with photometric tests of arc and incandescent lamps; measurement of heat units given off by lamps, their resistance (hot and cold); energy consumed in lamps; spectroscopic tests of purity of carbons; study of telegraph and telephone and of the application of electricity to railways; visits to manufactories, working systems, electric railways, etc.

In Magnetism, during the last year, attention has been given, both in lectures and in the laboratory work, to the investigation of the magnetic properties of iron, magnetic moment, intensity of magnetization, magnetic induction, permeability, susceptibility, hysteresis, etc. Both the inductive and magnetometer methods are used. The study the magnetic circuit and the designing and calculation of a dynamo form part of the regular work of each student.

A deposit of $25 is required from each student before he is allowed to work in the laboratory. From this, at the end of the term, is retained the cost of any material wasted or apparatus injured by him during the term.

The degree of Electrical Engineer (E.E.) will be given to the graduates of this course.

FRESHMAN CLASS.

FIRST TERM.

See page 64.

SECOND TERM.

Mathematics.—Olney's University Algebra, Part III. (3) Plane and spherical trigonometry and mensuration. Use of logarithmic tables. (2)

Chemistry.—Lectures and laboratory practice. Douglas and Prescott's Qualitative Analysis. (2)

French.—Grammar and reader (continued). (3) Or *German.*—Grammar and reader (continued). Bernhardt's Novelletten-Bibliothek, I. (3)

Drawing.—Descriptive geometry and isometric drawing. Warren's Elementary Projection Drawing. (3)

English.—Rhetoric. (2)

Essays.

Gymnasium. (2)

SOPHOMORE CLASS.

FIRST TERM.

Mathematics.—Analytical geometry: Olney's General Geometry. (4)

Physics.—Heat; text-book, Stewart. Magnetism and electricity; text-book, S. P. Thompson's Electricity and Magnetism. (3)

Mechanics, Sound and Heat.—(Physical laboratory.) (4)

Machine Design.—(2)

French.—Grammar. George Sand: La Mare au Diable. Dumas: Pauline. Or *German.*—Grammar. Bernhardt's Novelletten-Bibliothek, II. (2)

English.—Readings in English classics. (1)

Essays.

Gymnasium. (2)

SECOND TERM.

Mathematics.—Differential and integral calculus: Olney and Courtenay. (4)

Heat (continued), Magnetism, and Light.—(Physical Laboratory). (2)

Physics.—Magnetism; text-book, S. P. Thompson. Sound and Light; text-book, Stewart. (1)

Chemistry.—Lectures on Photography.

French.—Grammar. Vigny: Le Cachet Rouge. Hugo: La Chute. Dictation. (2) Or *German.*—Grammar. Riehl:

Culturgeschichtliche Novellen. Freytag: Aus dem Staat Friedrichs des Grossen. Dictation. (2)

Mechanics.—Theory of motion, statics, energy, center of gravity, moment of inertia, and general equations of motion. (4)

Steam Engine.—Holmes' Steam Engine. (3)

English.—Readings in English classics. (1)

Essays.

Gymnasium. (2)

JUNIOR CLASS.

FIRST TERM.

Mathematics.—Courtenay's Calculus and Wood's Analytical Mechanics. (2)

French.—Corneille, Racine, Molière, Hugo, etc. Dictation, Compositions. (2) Or *German.*—Lessing, Herder, Goethe. Schiller, Heine, etc. Dictation. Compositions. (2) Conversation class in both languages optional throughout the year.

Electricity and Magnetism.—Lectures with recitations; text-book, Slingo and Brooker's Electrical Engineering. (3)

Electricity; Electrical Measurements.—(Physical laboratory.) (3)

Meteorology.—Text-book and practice. (1)

Strength of Materials.—Elasticity and strength of wood, stone and metals. Theory of beams, columns, and shafts. Reports on the testing of materials. (4)

Boilers.—Wilson. Strength, construction and wear and tear of boilers. (1)

Essays and Original Orations.

Gymnasium. (2)

SECOND TERM.

Dynamo Design.—Text-book, S. P. Thompson's Dynamo-electric Machinery, with lectures.

Magnetic Properties of Iron.—Text-book, Ewing's Magnetic Induction in Iron. (3)

Electrical Measurements; Magnetic Properties of Iron. Physical Laboratory. (5)

French.—Readings. Compositions. Lectures on French Literature. (2) Or *German.*—Readings. Compositions. Lectures on German Literature. (2)

Surveying.—Theory and use of instruments. Location and construction of electric railways. (2)

Alternating Currents.—Recitations with text-book. (3)

Literature and History. (1)

Gymnasium. (2)

SENIOR CLASS.

FIRST TERM.

Dynamo Design (*continued*). (3)

Dynamic Machines and Electric Lighting.—Practice in running and care of. Tests of efficiency in generators and motors, photometric and spectroscopic tests of lamps, etc. (Physical laboratory.) (5)

Applications of Electricity.—Telegraphs and telephones. (3)

Astronomy.—Young's General Astronomy. (3)

Mechanics of Machinery.—Herrman-Smith. The graphical statics of mechanisms. (2)

Gymnasium.

SECOND TERM.

Electric Railways.—Text-book, Crosby and Bell. Plans for an electric railway, with maps, specifications, etc. (4)

Hydraulics. (2)

Measurement of Power.—Indicating of steam engines and dynamometer experiments. (1)

Lectures on English and American Literature. (2)

Christian Evidences. (1)

Preparation of Thesis.

Gymnasium.

THE COURSE IN CHEMISTRY.

This course of study is designed to prepare students for the profession of the chemist, in connection with metallurgical establishments, sugar refineries, gas works, superphosphate works, electrical machinery manufactories, mining companies, etc., and the general consulting and analytical work of the professional chemist. It is also well adapted for the preparation of teachers of chemistry and as a preliminary course to the study of medicine. It is eminently practical, the student's time being largely occupied by practical work in the large, well equipped and well ventilated chemical laboratories, which were completed in 1885 and constitute the best constructed building for this purpose in this country. The museum of chemistry contains large collections of specimens, for illustrating the lectures on theoretical and applied chemistry.

THEORETICAL CHEMISTRY.—Instruction in this subject begins with lectures four times a week, in the first term of the Freshman year. These lectures are fully illustrated by experiments, colored diagrams, working drawings and lantern pictures, and specimens from the museum. They include a general introduction to theoretical chemistry, and a description of the non-metallic and metallic elements and their compounds, the general subject of inorganic chemistry. The students are required to take notes of the lectures, and to pass a written examination at the end of the term.

In the second term of this year stoichiometry and chemical problems and reactions are taught by recitations twice each week.

The study of theoretical chemistry is continued throughout the Sophomore year by recitations three times a week from Tilden's Chemical Philosophy and Remsen's Chemistry, in the first term of the Junior year, by a course of lectures and recitations on theoretical organic chemistry, four times a week and twice a week in the second term.

These lectures are illustrated by experiments and by specimens from the museum of chemistry.

Written examinations are held at the close of each of the above courses.

Analytical Chemistry.—Qualitative analysis is taught in the second term of the Freshman year, by lectures, recitations, and practical work in the qualitative laboratory, twelve hours of practical work per week being required. This laboratory is a large, well ventilated, and well lighted room, supplied with convenient working tables, vacuum filtration, hoods for noxious vapors, steam baths, gas and washing appliances, and a commodious room for hydrosulphuric acid. Distilled water is delivered by faucet in this room and the other large laboratories. At the close of the term a practical examination is held in this subject.

After completing this course, quantitative analysis is pursued throughout the Sophomore and the first term of the Junior years. This subject is taught by lectures, recitations, and practical work in the quantitative laboratory, which is equipped similarly to the qualitative laboratory, but is supplied in addition with apparatus for drying precipitates and residues, rooms for the chemical balances, for combustions, and for a reference library.

Twelve hours per week are required during the first term of the Sophomore year and fifteen hours during the second term of that year and the first term of the Junior year.

The course consists in gravimetric and volumetric analyses, as applied to the substances given in the lists farther on, accuracy being required in the determination of each constituent.

At the close of each term written examinations are held upon the theory and practice of quantitative analysis.

Gas Analysis is taught by lectures and laboratory practice in the gas laboratory. This laboratory is supplied with full and complete apparatus for gas analysis, according to Bunsen's processes, as well as apparatus for some of the more rapid methods. Mixtures of gases are required to be analyzed by the students, within certain limits of error, and a written examination, on the theory and practice, is held at the close of the course.

ASSAYING.—The assaying of ores by furnace assay, together with gold and silver bullion analysis, by processes practiced in the United States Mint, is taught by lectures and practical work in the first term of the Senior year, nine hours of practical work per week being required. The course includes the assaying of ores of lead, tin, antimony, gold, silver, and iron, coal, and gold and silver bullion.

The assaying laboratory is supplied with large working tables, twenty-nine crucible and two iron furnaces, and eight muffle furnaces, with adjoining rooms for balances, and gold and silver bullion analysis.

A certain accuracy of results and a written examination as regards theory and practice are required.

ORGANIC CHEMISTRY.—The practical work in this subject is performed in the second term of the Junior year, fifteen hours per week being required, with conferences and recitations each week. The laboratory for this work is equipped similarly to the quantitative laboratory, in addition being supplied with steam, cold water and air blast upon the working tables, and a full supply of apparatus for the various determinations and experiments, including combustion furnaces, furnaces for heating sealed tubes, mercury pump, Hoffman's, Dumas' and Meyers' apparatus for vapor densities, nitrometers, chemical balances, etc.

The course consists of determinations of specific gravities, melting points, boiling points, vapor densities, chlorine, bromine, iodine, and sulphur of organic substances.

Combustion analysis, nitrogen determination, fractional distillation, and the preparation of several pure organic compounds and their analysis are included.

INDUSTRIAL CHEMISTRY.—A course of lectures is delivered upon this subject in the second term of the Senior year, illustrated by experiments, diagrams, lantern pictures, and specimens from the museum of chemistry. The working laboratories for this subject contain an apparatus for making illuminating gas, an alcohol still, worm and doubler, and a complete working model of a sugar refinery, including filters, vacuum pan, and centrifugal. There is also apparatus for use in the manufacture of chemicals, for dyeing, calico printing, and bleaching. In connection with these laboratories is a room containing a photometer and apparatus for determining the sulphur, ammonia, and specific gravity of illuminating gas; also a laboratory for the testing of alcoholic liquors, sugar, molasses, bone black, soap, petroleum, paints, dyes, superphosphates, and other commercial products, with the necessary technical apparatus. The students make practical experiments in this direction, and, with an instructor, visit various industrial establishments in this neighborhood and in and around New York City.

TOXICOLOGY.—A course of lectures on this subject is given in the first term of the Junior year, illustrated by experiments and by the large collection of specimens of poisons from the museum of chemistry. This is supplemented by a short course of laboratory work on some of the common poisons.

SANITARY CHEMISTRY.—During the second term of the Senior year attention is given to the qualitative and quantitative examination of air, water, food, disinfectants, and other subjects connected with this branch of the science. Special apparatus is provided for this work, as recommended by the best authorities on the subject.

PHOTOGRAPHIC CHEMISTRY.—A well equipped photographic laboratory and dark rooms are provided, in which the students of the chemical course receive practical instruction.

PHYSIOLOGICAL CHEMISTRY.—The examination of urine, blood, etc., receives a proper amount of attention.

The course also includes instruction in physics, mineralogy, blowpipe analysis, metallurgy, and geology, which are of great value to the chemist.

MICROSCOPY.—Instruction in the use of the microscope is given in the first term of the Senior year.

In the Senior year the student is required to prepare a thesis on some subject, selected by the Professor of Chemistry, involving practical work in the laboratory in addition to the literary labor, each graduate thus making a contribution to the progress of the science, as a preliminary to the reception of his degree.

The graduate of this course receives the degree of Analytical Chemist (A.C.).

Students, not candidates for a degree, are admitted for special courses in chemistry, of which they will receive certificates.

The laboratories are under the immediate charge of the Professor and Instructors of Chemistry and are open to the students from 8 o'clock A.M. to 6 o'clock P.M., including Saturdays. Students are at liberty to work in the laboratories beyond the required hours as their time may permit. Students are charged for materials and apparatus consumed; with moderate care this expense need not exceed $50 per year.

FRESHMAN CLASS.

FIRST TERM.

See page 64.

SECOND TERM.

Mathematics.—Olney's University Algebra, Part III. (3) Plane and spherical trigonometry and mensuration. Use of logarithmic tables. (2)

Chemistry.—Lectures and laboratory practice. Douglas and Prescott's Qualitative Analysis. (4)

German.—Grammar and Reader (continued). Bernhardt's Novelletten-Bibliothek, I. (3)

Stoichiometry. (2)

English.—Rhetoric. (2)

Essays.

Gymnasium. (2)

SOPHOMORE CLASS.

FIRST TERM.

Chemical Philosophy. — Tilden. Chemical calculations. Whiteley. (3)

Quantitative Analysis.—Fresenius' Quantitative Analysis. (4) The following analyses are executed by the student:

1. Iron wire (Fe).
2. Potassium dichromate (Cr_2O_3).
3. Barium chloride (Ba, Cl, H_2O).
4. Magnesium sulphate (MgO, SO_3, H_2O).
5. Disodium hydrogen phosphate (P_2O_5).
6. Rochelle salt (K_2O, Na_2O).
7. Volumetric determination of chlorine.
8. Acidimetry (HCl, H_2SO_4, HNO_3, $HC_2H_3O_2$).
9. Alkalimetry (KOH, NaOH, NH_4OH, soda ash, pearl ash).
10. Chlorimetry (bleaching powders).

Quantitative Analysis.—Conference. (1)

Physics.—Heat, magnetism, and electricity. Lectures and recitations. (5)

German.—Grammar. Bernhardt's Novelletten-Bibliothek, II. (2)

English.—Readings in English classics. (1)

Essays.

Gymnasium. (2)

SECOND TERM.

Physics.—Sound and light. Lectures and recitations. (3)

German.—Grammar. Riehl: Culturgeschichtliche Novellen. Freytag: Aus dem Staat Friedrichs des Grossen. Dictation. (2)

Quantitative Analysis.—Fresenius' Quantitative Analysis. (5)

The following analyses are executed by the student:

11. Copper ore (Cu).
12. Zinc ore (Zn). By both gravimetric and volumetric Methods.
13. Lead ore (Pb, S).
14. Silver coin (Au, Pb, Ag, Cu).
15. Spiegeleisen (Mn).
16. Copper alloys (complete analysis).
17. Ilmenite (TiO_2).
18. Iron ore (complete analysis).
19. Limestone (complete analysis).
20. Coal (volatile matter, fixed carbon, ash, H_2O, S, P).
21. Slag (complete analysis).

Quantitative Analysis.—Conference. (1)

Blow-Pipe Analysis.—Lectures, with practice. Plattner, Brush, or Nason and Chandler. (1)

Chemistry.—Remsen. Advanced course. (3)

English.—Readings in English classics. (1)

Essays.

Gymnasium. (2)

JUNIOR CLASS.

FIRST TERM.

Toxicology.—Lectures. (2)

Quantitative Analysis.—Fresenius' Quantitative Analysis. (5)

The following analyses are executed by the student:

22. Guano (NH_3, P_2O_5, H_2O).
23. Clay (complete analysis).
24. Manganese ore (MnO_2).
25. Mineral water (complete analysis).
26. Pig iron (complete analysis).
27. Nickel ore (Ni, Co).
28. Carbon in steel (volumetric).
29. Gas analysis.

Quantitative Analysis.—Conference. (1)

Organic Chemistry.—Lectures and recitations. (4)

Crystallography.—Lectures, with practical exercises in the determination of crystals. (2)

German.—Lessing, Herder, Goethe, Schiller, Heine, etc. Dictation. Compositions. (2) Conversation class in both languages optional throughout the year.

Essays and Original Orations.

Gymnasium. (2)

SECOND TERM.

Organic Chemistry.—Laboratory. (5)

Organic Chemistry.—Lectures and conferences. (2)

Metallurgy.—Metallurgical processes. Furnaces. Refractory building materials. Combustion. Natural and artificial fuels. Metallurgy of iron. (4)

German.—Readings. Compositions. Lectures on German literature. (2)

Mineralogy.—Descriptive mineralogy, with practical exercises in the determination of minerals. E. S. Dana. (3)

Gymnasium. (2)

SENIOR CLASS.

FIRST TERM.

Metallurgy.—Of copper, lead, silver, gold, etc. (5)

Assaying.—Including the assay by the dry method of gold, silver, antimony, lead, iron, and tin ores, coal, gold and silver bullion, and rich lead. Ricketts. (3)

Industrial Chemistry.—Laboratory. (3)

Geology.—Williams' Lithology, with practical exercises in determining rocks. (3)

Microscopy.—Laboratory. (2).

Preparation of Thesis.

Gymnasium.

SECOND TERM.

Industrial Chemistry.—Lectures. (3)
Industrial Chemistry.—Laboratory. (3)
Industrial Chemistry.—Conference. (1)
Agricultural Chemistry.—Laboratory. (1)
Sanitary Chemistry.—Laboratory. (1)
Geology. — Historic and dynamic geology. Lectures. Geikie. (2)
Christian Evidences.—Lectures. (1)
Lectures on American and English Literature. (2)
Preparation of Thesis. (2)
Gymnasium.

THE COURSE IN ARCHITECTURE.

The studies in this course are closely allied with those in civil engineering, the higher surveying, railroad work, mineralogy, geology, and astronomy being omitted, instead of which architectural drawing and designing is substituted as seen in the following program. Instruction is also given in the history and æsthetics of architecture, in methods of heating and ventilating, in boilers and hoisting machinery, and in house drainage and sewerage.

During the first and second years the student lays the foundation for his professional work by the study of mathematics, physics, mechanics, drawing, surveying, English, and French or German. The course in drawing includes the use of water colors, free-hand, projection and isometric drawing, and their application to the general plans for a small building. In surveying there is field practice in the use of instruments, and also map drawing, thus enabling the student to understand the application of the subject to landscape gardening, and to the location of buildings.

During the third and fourth years of the course the work is of a more professional character. The subject of construction familiarizes the student with brick, stone, cement, and other materials, with foundations and masonry, with arches, piers, and walls, and with the stone-cutter's art. There is a full course in the theory and calculation of columns, beams, and shafts, in the strength of materials and its application to roof trusses and bridges. Working drawings of arches, piers, and roof trusses are made in detail. Plans and estimates are prepared for wooden, brick, stone, and iron buildings, the work being done according to standard specifications. In connection with the course visits of inspection are made to the numerous engineering structures in the Lehigh Valley and vicinity.

The student who completes all the subjects of this course will receive the degree of Bachelor of Science in Architecture (B. S.).

FRESHMAN CLASS.

FIRST TERM.

See Page 64.

SECOND TERM.

Mathematics.— Olney's University Algebra, Part III. (3) Plane and spherical trigonometry and mensuration. Use of logarithmic tables. (2)

Construction.—Materials. Masonry. Carpentry. Roads and pavements. Sketches and structures. (2)

French.—Grammar and Reader (continued). (3) Or *German.* —Grammar and Reader (continued). Bernhardt's Novelletten-Bibliothek, I. (3)

Drawing.—Descriptive geometry and isometric drawing. Tracings. Warren's Elementary Projection Drawing. (3)

English.—Rhetoric. (2)

Essays.

Gymnasium. (2)

SOPHOMORE CLASS.

FIRST TERM.

Mathematics. — Analytical geometry: Olney's General Geometry. (4)

Physics.—Heat, magnetism, and electricity. Lectures and recitations. (5)

French.—Grammar. George Sand: La Mare au Diable. Dumas: Pauline. (2) Or *German.*—Grammar. Bernhardt's Novelletten-Bibliothek, II. (2)

Drawing.—Architectural drawing. Plans of piers and arches. Problems in stone cutting. (4)

English.—Readings in English classics. (1)

Essays.

Gymnasium. (2)

SECOND TERM.

Mathematics.—Differential and integral calculus: Olney and Courtenay. (4)

Physics.—Sound and light. Lectures and recitations. (3)

French.—Grammar. Vigny: Le Cachet Rouge. Hugo: La Chute. Dictation. (2) Or *German.*—Grammar. Riehl: Culturgeschichtliche Novellen. Freytag: Aus dem Staat Friedrichs des Grossen. Dictation. (2)

Mechanics.—Theory of motion, statics, energy, center of gravity, moment of inertia, and general equations of motion. (4)

Surveying.—Theory and use of compass, level, and transit. Surveys and maps of farms. Leveling. (3)

English.—Readings in English classics. (1)

Essays.

Gymnasium.

JUNIOR CLASS.

FIRST TERM.

Mathematics.—Courtenay's Calculus, and Wood's Analytical Mechanics. (2)

French.—Corneille, Racine, Molière, Hugo, etc. Dictation. Compositions. (2) Or *German.*—Lessing, Herder, Goethe, Schiller, Heine, etc. Dictation. Compositions. (2) Conversation class in both languages optional throughout the year.

Strength of Materials. — Elasticity and strength of wood, stone, and metals. Theory of beams, columns, and shafts. Reports on the testing of materials. (4)

Construction.—Foundations. Specifications and estimates. Reports on structures. Tests of cements. (2)

Drawing. — Shades, shadows, and linear perspective. Sketches and designs for ornaments and simple details. (6)

Essays and Original Orations.

Gymnasium. (2)

SECOND TERM.

French.—Readings. Compositions. Lectures on French literature. (2) Or *German.* — Readings. Compositions. Lectures on German literature. (2)

Roofs and Bridges. — Theory and calculation of strains in roof and bridge trusses. Graphical statics. (5)

Construction.—Retaining walls, masonry dams, and stone arches. Plans and estimates. (2)

Architecture.—Designs and estimates for brick and stone buildings. (4)

History.—The history and styles of architecture. (2) Lectures on Roman antiquities. (1)

Literature and History. (1)

Gymnasium. (2)

SENIOR YEAR.

FIRST TERM.

Roofs and Bridges. — Cantilever, suspension, and arch bridges. Designs for plate girders and riveted roof trusses. (6)

Mechanics of Machinery.—Pile drivers, cranes, and elevators. (2)

Boilers.— Strength, construction, and wear and tear of boilers. Wilson. (1)

Architecture. — Specifications and estimates. Design for an iron building. (5)

Heating and Ventilation.—Systems of heating, lighting, and ventilating buildings. (2)

Gymnasium.

SECOND TERM.

Hydraulics.—Efflux of water from orifices, and flow in pipes and channels. Hydraulic motors. Practical work in the hydraulic laboratory. (2)

Sanitary and Irrigation Engineering.—Collection, purification, and distribution of water. Systems of water supply. The combined and the separate system of sewerage. Drainage and sewerage of buildings. (4)

Roofs and Bridges.—Design for a pin-connected roof truss, with working drawings and estimates. (3)

Architecture.—Building superintendence. The æsthetics of architecture. Original plans, estimates, and specifications. (4)

Lectures on English and American Literature. (2)

Christian Evidences.—Lectures. (1)

Preparation of Thesis.

Gymnasium.

PHYSICAL CULTURE.

The Gymnasium is open morning, afternoon and evening, in all, 45 hours a week. Exercise in it is required of all students who are fitted to take it. Class drill with the Instructor and individual exercise are prescribed.

GRADUATING THESES.

Every student will be required to present a thesis upon some topic connected with his special course, as a necessary portion of the exercises for his final examination for a diploma. These theses shall be accompanied by drawings and diagrams, when the subjects need such illustration. The originals will be kept by the University, as a part of the student's record, for future reference; but a copy may be retained by the student, and be published, permission being first obtained from the President.

DIPLOMAS AND CERTIFICATES.

The Diploma is given only to those who have passed all the examinations in a regular course and is signed by the Secretary of the Board of Trustees and by the Faculty of the University. For all the partial courses a certificate is given, signed by the Secretary of the Faculty, and showing what the student has accomplished.

GRADUATE STUDENTS.

Graduate students wishing to remain a year or more and pursue a course of study as candidates for another Degree may do so with the sanction of the Faculty. Those wishing to take *special* courses of study will be afforded every facility for so doing.

POST-GRADUATE DEGREE.

M. A.

The Faculty will recommend for the Degree of Master of Arts any candidate, otherwise properly qualified, who, after taking at this University the Degree of Bachelor of Arts, shall pursue, for at least one year at this University, or two years elsewhere, a course of liberal study prescribed by the Faculty in at least two departments, (under at least two professors), pass a thorough examination in the same and present a satisfactory Thesis.

M. S.

The Faculty will recommend for the Degree of Master of Science any candidate, otherwise properly qualified, who, after taking at this University the Degree of Bachelor of Science, or any Degree in the School of Technology, shall pursue, for at least one year at this University, or two years elsewhere, a course of study prescribed by the Faculty in at least two departments, (under at least two professors), pass a thorough examination in the same and present a satisfactory Thesis.

Ph. D.

The Faculty will recommend for the Degree of Doctor of Philosophy any candidate, otherwise properly qualified, who, after taking at this University the Degree of Master of Arts or Master of Science, shall pursue, for at least one year at this University, a course of advanced study prescribed by the Faculty, in at least two departments, (under at least two professors), pass a thorough examination in the presence of the Faculty in the same and present a satisfactory Thesis giving evidence of original investigation.

The candidate shall have a good knowledge of Latin and either French or German.

The Theses presented by candidates for Post-Graduate Degrees shall be retained by the University.

Applicants for any of these degrees will be required to complete the prescribed work within the allotted time. Special action of the Faculty is required for any extension of time.

THE UNIVERSITY LIBRARY.

The Library building was erected by the Founder of the University in 1877, at a cost of $100,000, as a memorial of his daughter, Mrs. Lucy Packer Linderman, and during the same year more than $20,000 were contributed by her family and friends as a memorial fund for the purchase of books. By the will of the Founder of the University a fund of $500,000 has been given for the permanent endowment of the library.

The building is semi-circular in plan, with a handsome façade in the Venetian style of architecture. It is constructed of Potsdam sandstone with granite ornamentation. In the interior, the center is occupied as a reading space, fifty by forty feet, from which radiate the book cases, extending from floor to ceiling; two galleries affording access to the upper cases. Shelf room is now provided for one hundred and sixty thousand volumes. The building is thoroughly fireproof, well lighted, and heated by steam.

Ninety-three thousand volumes are now upon the shelves, including many extremely valuable works. The list of periodicals numbers about two hundred and fifty, embracing as far as possible all departments of knowledge.

The Library is conducted strictly for consultation, and is open to the use of the public; both of which conditions are in accord with the terms of the gift.

REGULATIONS OF THE LEHIGH UNIVERSITY LIBRARY.

I. The Library is open every day, except Sundays and Legal Holidays, from 8 A.M. until 10 P.M., and on Sundays for the students and others connected with the University from 1.30 P.M. until 9.30 P.M.

II. Admission is free to all persons over 16 years of age.

III. Readers are required to write their names and addresses in the Daily Register of the Library. They also write the name of the book desired upon a Library Card, with their signatures, and present the same to the Director's Clerk, who supplies the book, retaining the card as a receipt. Before leaving the Library, readers return their books to the clerk, and receive their cards.

IV. The University Professors and Instructors, only, are allowed to take books from the Library Building.

V. No person is allowed to enter the alcoves, or remove any book from the shelves, without permission of the Director.

VI. Readers wishing to consult the more valuable illustrated works make special application for that purpose.

VII. In taking notes, pencils, and not pens and ink, are to be used.

VIII. Audible conversation and the use of tobacco are strictly forbidden in any part of the Library.

IX. Any person not conforming to these Regulations will be denied the privilege of the Library.

X. Any person who defaces, in any way, any book, magazine or paper, or the furniture, or any portion of the building, in addition to being deprived of the privileges of the Library will be prosecuted according to law.

OBSERVATORY.

By the liberality of Robert H. Sayre, Esq., one of the Trustees of the University, an astronomical observatory was erected on the University grounds, and placed under the charge of the Professor of Mathematics and Astronomy.

In the dome of the observatory is mounted an equatorial telescope, of six inches aperture, by Alvin Clark & Sons. The west wing contains a superior sidereal clock, by Wm. Bond & Sons; a zenith telescope, by Blunt, and a field transit, by Stackpole. There is also a prismatic sextant, by Pistor & Martins.

Students in practical astronomy receive instruction in the use of the instruments and in actual observation.

The grounds upon which the Observatory stands, consisting of seven acres of land adjoining the original grant, were presented to the University by Charles Brodhead, Esq., of Bethlehem.

THE UNIVERSITY MUSEUM.

In addition to the large collection illustrating all branches of Industrial Chemistry, the Museum includes collections in Metallurgy, Geology, Zoölogy, and Archæology.

The Metallurgical Cabinet already includes specimens illustrating the various processes for obtaining the more common metals.

The Zoölogical Cabinet includes the Werner collection of nearly all the types of American birds with their nests and eggs, and the Packer collection of recent shells.

The Geological Cabinet numbers over ten thousand specimens and includes the Palæontological, Mineralogical, Petrographic, and Economic collections. The first contains good specimens of nearly all the common genera. The Mineralogical division includes the Keim and Rœpper collections—the latter being especially complete and valuable from a crystallographic standpoint. The Petrographic division numbers several thousand specimens and, besides including numerous varieties of nearly all the rocks of the globe, contains a duplicate set from the collection of the Second Geological Survey of this State. The Economic division was formed and donated by Dr. James P. Kimball, ex-Director of the Mint, and formerly Professor of Economic Geology.

The Cummings Archæological Cabinet numbers three thousand specimens and includes Dr. Stubbs' collection of Indian relics, weapons, and utensils.

SUMMER SCHOOL OF SURVEYING.

A Summer School of Surveying, extending over a period of five or six weeks, is held during the long vacation, provided that the attendance of at least twelve students is assured. In 1894 the school will open on August 1 at Hazleton, Pa., or at some other place in the anthracite coal region. Applications to join it should be made to the President before June 1, 1894.

Students of the University who have completed the surveying work of the Sophomore year, and other persons who present satisfactory evidence of having a good knowledge of algebra, trigonometry, and land surveying, and of having had some practice with the transit and level, may be admitted to the Summer school. The tuition fee is $25, payable in advance.

The work of the Summer school is under the direction of the Professor of Civil Engineering. Instruction is given by lectures or text-books in the theory of instruments, their care and adjustments, in the best processes for topographical work, in geodesy, and in the method of least squares. The field work includes base line measurements, topography by stadia, plane table, and other methods, leveling, sketching, and all the operations of a complete topographical survey. The office work comprises the computations necessary for the reduction of the field notes, including the adjustment of the triangulation, practice in topographical drawing, and the preparation of a finished map of the territory covered by the survey. One day in each week will be devoted to visits of inspection to mines, quarries, bridges, and engineering works in Eastern Pennsylvania.

At the close of the session of the Summer school, examinations are held covering its entire course of theory and practice. Students of the University holding certificates of having completed the work of the school are not required to take the regular courses in surveying given in the Civil Engineering department during the first term of the Junior year, and the first term of the Senior year.

THE CHEMICAL AND NATURAL HISTORY SOCIETY OF THE LEHIGH UNIVERSITY.

This Society was organized in the Fall of 1871, as "The Chemical Society," but was afterwards expanded, as its present title indicates, and admits, by election, students from all departments of the University.

The collections of botanical and zoölogical specimens belonging to the Society are already important. During the past years persons have been sent to Texas and Brazil to collect specimens for these cabinets.

The Society has organized and maintained several courses of public scientific lectures.

Among the honorary members of the Society are more than one hundred of the most distinguished scientists in Europe and the United States.

THE ENGINEERING SOCIETY.

This Society was organized in 1873, and admits, by election, students in the Junior and Senior Classes. Its meetings are held fortnightly. At these, papers relating to engineering subjects are read and discussed. From 1885 to 1890 it issued quarterly five volumes of "The Journal of the Engineering Society," containing contributions by the members, alumni, and others. Many of the papers read before this society since 1890 have been published in "The Lehigh Quarterly," a journal published by the students of the University.

THE MINING CLUB.

This was organized in 1883 and takes from the Junior, Senior, and Post-Senior Classes those members of the Mining School who excel in their studies or in practical experience in the subjects of the course.

THE ELECTRICAL ENGINEERING SOCIETY

was organized in November, 1887, by students in the Advanced Course in Electricity. Its object is to supplement the regular work of the department by the study and discussion of electrical subjects.

THE AGORA

is a literary society which meets semi-monthly. Only students in the School of General Literature are eligible to membership.

THE ATHENÆUM

is also a literary society, whose active membership is confined to the Sophomore Class. The meetings are held weekly.

THE CLASSICAL CLUB.

This organization was founded in the Spring of 1889, and consists of the students in the Classical and Latin-

Scientific Courses, together with those members of the Faculty who are interested in this department of learning. At its monthly meetings, papers upon philological, historical, and archæological subjects are read by students belonging to the upper classes, and are then discussed and criticised. Thus independent work is encouraged and correct methods of investigation are acquired. This is especially valuable for those men who purpose becoming teachers or original investigators. Reports upon new discoveries and reviews of recent books vary the proceedings and keep the members informed in regard to the advances of philological science.

THE NATURAL SCIENCE CLUB OF THE LEHIGH UNIVERSITY.

The object of this organization is systematic study, in connection with field work, in natural history and its associated subjects. Its members are engaged in making a survey, both botanical and mineralogical, of the region within a radius of five miles from the University and propose to collect an herbarium and mineralogical cabinet which shall contain specimens of all the plants and minerals within this district.

THE LEHIGH UNIVERSITY CHRISTIAN ASSOCIATION.

This is a voluntary organization of the students for the promotion of the religious, moral, and social life in the University. It was organized April 18, 1890, and on Oct. 11, 1890, united itself with the Intercollegiate Young Men's Christian Association. The movement is distinctly for and by students, all the officers being chosen from the student body. Those connected with Evangelical churches of whatever creed are eligible to *active membership; associate membership* may be claimed by men of good moral standing who are not members of churches. The association is continually growing, and is extending a marked influence for good among the men.

THE BIBLE CLASS.

A class for the reverent study of the sacred Scriptures, under the direction of the Chaplain, meets every Sunday afternoon at half past three o'clock. This class aims at both practical and theoretical results—the edification of its members in the Word of God, and the application of the (so-called) "scientific" or "historical" method to the study of Holy Writ.

FOUNDER'S DAY.

On the second Thursday of October of each year, Commemorative Exercises are held in honor of the Founder of the University.

UNIVERSITY SERMON.

This sermon is preached on the Sunday before University Day.

The Rt. Rev. Thomas Underwood Dudley, Bishop of Kentucky, was the preacher on Sunday, June 18, 1893, in the Memorial Church.

THESES.

Theses on the following subjects were prepared by candidates for degrees in 1893:

FOR THE DEGREE OF PH.D.

"A calorimetric study of copper."

JOSEPH WILLIAM RICHARDS, A.C., M.S.

FOR THE DEGREE OF M.A.

"The early relations between Egypt and the Greeks."

SAMUEL ERWIN BERGER, B.A.

"The character of the public oratory of Athens in the time of Demosthenes."

ELLIS ANSTETT SCHNABEL, B.A.

FOR THE DEGREE OF E.M.

"South Mountain glaciation."

JOSEPH BARRELL, B.S.

"The Mesabé Range."

CHARLES MERRITT CASE, B.S.

"Review of the ventilation law of Pennsylvania."

GEORGE PRICE CASE, B.S.

"Genesis of the Friedensville zinc ores."

GEORGE WASHINGTON ENGEL, B.S.

"Availability of the Plaza d'Oro gold field for hydraulic mining."

HENRY LEFEVRE, B.S.

"The Taylor gas producer with regenerative spelter furnace in use by The Lehigh Zinc and Iron Co."

HENRY LEWIS MANLEY, B.S.

"A calorimetric study of copper."

HENRY ORTH, JR., B.S.

FOR THE DEGREE OF B.A.

"Tiberius."

WALTER JOSEPH DECH.

"Oratory in the Odyssey."

CHARLES MALCOLM DOUGLAS.

"Lucretius's theories of the universe and life."

GEORGE STERN.

FOR THE DEGREE OF B.S.

"Frœbel, or the new education."

GILBERT FORBES BURNETT.

"Charlemagne."

GEORGE WILLIAM RITCHEY.

FOR THE DEGREE OF C.E.

"A review of span No. 27 of the western approach to the Walnut Street bridge, Philadelphia, Pa."

GEORGE HALDEMAN ATKINS.

"Design of a system of sewerage for South Bethlehem, Pa."

HUGH C. BANKS.

"Design for a high viaduct."

HERMAN RENNER BLICKLE.

"Experiments on the deflection of the catenary under concentrated loads."

WILLIAM IRVIN BOYD.

"The lateral deflection of columns."

FRED. EDGAR BRAY.

"Design for a lenticular parabolic highway bridge at Sellersville, Pa."

WARREN FELLMAN CRESSMAN.

"Experiments on pile driving, and a comparison of several formulas."

ROBERT FOSTER GADD.

"The draining of a bituminous coal mine."

LEE STOUT HARRIS.

"Design for a separate sewerage system at Freemansburg, Pa."

CLAUDE SANFORD HAYNES.

"Bricks and brick-making."

SCHUYLER BRUSH KNOX.

"The old bridge over the Lehigh River at Bethlehem, Pa."

CHARLES LOUIS MCKENZIE.

"Design for a steel highway bridge over the Lehigh River at Bethlehem, Pa."

GEORGE HOLBROOKE MAURICE.

"Design of a separate system of sewers for Allentown, Pa."

WILLIAM FREDERICK MYLANDER.

"Declination of the magnetic needle at South Bethlehem, Pa., and the local attraction at several stations in the L. U. triangulation."

CLINTON LEDYARD OLMSTEAD.

"Review of the sewerage system of Norfolk, Va."

NATHANIEL M. OSBORNE, JR.

"Comparison of three hinged arch and truss structure."

JOHN GATES PECK.

"Design for a draw bridge of two hundred and twenty feet span."

JOHN GRAHAM REID.

"Discussion of the water supply of Chevy Chase, Md."

EDWIN CLARK REYNOLDS.

"Design for a system of sewerage for Columbus, Miss."

FRANCIS EVANS RICHARDS.

"Review of the water supply of South Bethlehem, Pa."

MARTIN LUTHER SAULSBURY.

"Design and detail drawings of a camelback highway bridge. Span 180 feet."

ARMIN SCHOTTE.

"Discussion and comparison of railroad rail-joints."

NOEL W. SMITH.

"Survey and estimate for the construction of an electric railway from Washington, D. C., to Mount Vernon."

FRED. CONOVER WARMAN.

FOR THE DEGREE OF M.E.

"Experiments to determine the power absorbed by a 56-inch circular saw."

HENRY BROWN EVANS and
ROBERT CULBERTSON HAYS HECK.

"Kinematic analysis of the linotype machine."

GEORGE HARWOOD FROST.

"Traveling cranes."

CHARLES LINCOLN KELLER.

"Determination of the tangential pressures and coefficients of unsteadiness of a 'Ball' and of a 'Corliss' compound engine."

JAMES EDGAR MILLER.

"The Archer gas fuel process."

DUNCAN WHITE PATTERSON.

"A cheap, efficient dust guard."

THOMAS HARRISON SYMINGTON.

FOR THE DEGREE OF B.S.
(IN METALLURGY.)

"A new process of reducing Franklinite ores, used at South Bethlehem, Pa.

NOBLE BANKS.

"The manufacture of open-hearth steel at Steelton, Pa."

ALEXANDER BEATTY SHARPE and
EDWARD AUGUSTUS SOLELIAC.

FOR THE DEGREE OF B.S.
(IN MINING.)

"The stripping system of mining anthracite coal, as practiced at Audenried, Pa."

HIRAM DRYER MCCASKEY.

FOR THE DEGREE OF E.E.

"Design, construction, and tests of an incandescent 20-light dynamo."

HARRY JACOBS ATTICKS.

"Life and efficiency tests of the Westinghouse stopper incandescent lamp."

CHARLES HAZARD DURFEE.

"Design, construction, and tests of a 500-watt closed magnetic circuit-transformer."

FREDERICK PARDEE FULLER.

"The Bethlehem division of the Allentown and Bethlehem Rapid Transit Co."

CHARLES WILLITS GEARHART.

"Construction and tests of a dynamo."

RICHARD WILLIS HEARD.

"Temperature coëfficient of aluminium."

WILLIAM PRICE MARR.

"The Washington and Mt. Vernon Electric Railway."

CHARLES JOSEPH O'NEILL.

"Electric welding and calculations, and design of an electric welder."

CHARLES WILLIAM PARKHURST.

"The Edison municipal system."

FREDERICK BRITTAN SAGE.

"The testing of telephone cables."

WILLIAM REMICK STINEMETZ.

"Electricity applied to pumping mine-water."

LEWIS ESLER TROUTMAN.

FOR THE DEGREE OF A.C.

"On a new disazo color, named Lehigh Lavender."

GEORGE EDWIN CHAMBERLAIN.

"Cotton seed and its products."
BERNARD ENRIGHT.

"The magnetic concentration of iron ores."
HARVEY HARTZELL GODSHALL.

"The bleaching of cotton cloth."
SAMUEL LAURY GRAHAM, JR.

"Alizarin."
FRANK SIGISMUND LOEB.

"Microscopic analysis of butter and lard."
RAYMOND BERNARD RANDOLH.

"Silicon."
JOSEPH A. SCHLOSS.

"The manufacture of oil of vitriol."
WILLIAM FREDERICK SEMPER.

"Tirconium."
JOHN TAYLOR, JR.

UNIVERSITY DAY.

This day is the last of the academic year, and falls in 1894 on the third Wednesday in June. On this day orations are delivered by members of the graduating class, and degrees are conferred.

EXERCISES ON JUNE 21, 1893.

Reading of Scripture and Prayer by the Rev. Elwood Worcester, Ph.D., Chaplain of the University.

Salutatory Oration.—"George Clark Rogers."
HENRY BROWN EVANS.

Oration.—"The Limitations of Knowledge."
HARRY JACOBS ATTICKS.

Oration.—"The Province of Poetry."
CHARLES MALCOLM DOUGLAS.

Oration.—"The Emancipation of the Mind."
GEORGE STERN.

Oration.—"Joan of Arc."
WALTER JOSEPH DECH.

Oration.—"Imagination and Science."
GEORGE HOLBROOKE MAURICE.

Valedictory Oration.
ROBERT CULBERTSON HAYS HECK.

Award of the Wilbur Scholarship to
WARREN BYRON KEIM,
of Reading, first in rank in Sophomore Class.

The Wilbur Prizes were awarded as follows:

Freshman Class, Mathematics, to

WARREN JOSHUA BIEBER, of Bethlehem.
MAXIMILIAN JOSEPH BUCHER, of Columbia.

Freshman Class, French, to
EDWARD COPPÉE THURSTON, of South Bethlehem.

Freshman Class, German, to
SAMUEL MOSES DESSAUER, of Montrose.

Freshman Class, Themes, to
WILLIAM STEWART AYARS, of Wilkes-Barre.

Freshman Class, Rhetoric, to
JOSEPH WHARTON THURSTON, of South Bethlehem.

Freshman Class, Freehand Drawing, to
DAVIS WILLIAM WILSON, JR., of Brooklyn, N. Y.

Freshman Class, General Chemistry, to
JAMES GEORGE BEACH, of Apalachin, N. Y.

The following Degrees were conferred:

M.A.

SAMUEL ERWIN BERGER, B.A.
ELLIS ANSTETT SCHNABEL, B.A.

E.M.

JOSEPH BARRELL, B.S.
GEORGE PRICE CASE, B.S.
GEORGE W. ENGEL, B.S.
HENRY LEFEVRE, B.S.
HENRY ORTH, JR., B.S.

B.A.

CHARLES MALCOLM DOUGLAS.
WALTER JOSEPH DECH.
GEORGE STERN.

B.S.

GILBERT FORBES BURNETT.
GEORGE WILLIAM RITCHEY.

C.E.

GEORGE HALDEMAN ATKINS.
HUGH CUNNINGHAM BANKS.
HERMAN RENNER BLICKLE.
WILLIAM IRVIN BOYD.
FREDERICK EDGAR BRAY.
WARREN FELLMAN CRESSMAN.
ROBERT FOSTER GADD.
LEE STOUT HARRIS.
CLAUDE SANFORD HAYNES.
SCHUYLER BRUSH KNOX.
CHARLES LOUIS McKENZIE.
GEORGE HOLBROOKE MAURICE.
WILLIAM FREDERICK MYLANDER.
CLINTON LEDYARD OLMSTED.
NATHANIEL MONTGOMERY OSBORNE, JR.
JOHN GATES PECK.
JOHN GRAHAM REID.
EDWIN CLARK REYNOLDS.
FRANCIS EVANS RICHARDS.
MARTIN LUTHER SAULSBURY.

ARMIN SCHOTTE.
NOEL W. SMITH.
FRED CONOVER WARMAN.

M.E.

HENRY BROWN EVANS.
GEORGE HARWOOD FROST.
ROBERT CULBERTSON HAYS HECK.
CHARLES LINÇOLN KELLER.
JAMES EDGAR MILLER.
DUNCAN WHITE PATTERSON.
THOMAS HARRISON SYMINGTON.

B.S.

(IN METALLURGY.)

NOBLE BANKS.
ALEXANDER BEATTY SHARPE.
EDWARD AUGUSTUS SOLÉLIAC.

B.S.

(IN MINING.)

HIRAM DRYER McCASKEY.

E.E.

HARRY JACOBS ATTICKS.
CHARLES HAZARD DURFEE.
FREDERICK PARDEE FULLER.
CHARLES WILLITS GEARHART.
RICHARD WILLIS HEARD.
WILLIAM PRICE MARR.
CHARLES JOSEPH O'NEILL.
CHARLES WILLIAM PARKHURST.
FREDERICK BRITTAN SAGE.
WILLIAM REMICK STINEMETZ.
LEWIS ESLER TROUTMAN.

A.C.

GEORGE EDWIN CHAMBERLAIN.
BERNARD ENRIGHT.

HARVEY HARTZELL GODSHALL.
SAMUEL LAURY GRAHAM, JR.
FRANK SIGISMUND LOEB.
RAYMOND BERNARD RANDOLPH.
JOSEPH A. SCHLOSS.
WILLIAM FREDERICK SEMPER.
JOHN TAYLOR, JR.

THE WILBUR SCHOLARSHIP.

This Scholarship was founded in 1872 by E. P. Wilbur, Esq., of South Bethlehem, and is the sum of $200 awarded annually to the student in the Sophomore Class having the best record.

THE ALUMNI SCHOLARSHIP.

The Alumni Association of the University has established a Scholarship of the value of $250 per annum, subject to the following conditions:

1. That the Scholarship shall only be awarded to a student in need of it.

2. That the Scholarship shall not apply to the first year of any student's course; he must without this aid have gone through one year, and must be prepared to start the second year free from all conditions.

3. That the Scholarship shall not be continued to a student who shall at any time during his course carry any condition over eight weeks beyond the date of the examination in which he failed.

Subject only to the above conditions the disposal of the fund shall until otherwise directed be in the hands of the President of the University.

THE HENRY S. HAINES MEMORIAL SCHOLARSHIP.

Mrs. Henry S. Haines, of Savannah, Ga., has established a scholarship of the annual value of $200, which is to be devoted to the support at the Lehigh University, throughout his scholastic career, of one student in the School of Mechanical Engineering; the selection to be made by Mrs. Haines herself during her life-time.

WILBUR PRIZES.

By the generosity of E. P. Wilbur, Esq., a fund has been established, yielding an annual income of $100, for distribution in prizes as the Faculty shall determine.

ALUMNI PRIZES FOR ORATORY.

The "Alumni Association of the Lehigh University" has established an annual sum of Fifty Dollars, to be distributed as prizes for excellence in Oratory, subject to the following

REGULATIONS.

1. The Contest shall be held on the 22d day of February, or on the day designated by the University to commemorate the birthday of Washington.

2. There shall be a first prize of $25, a second of $15, and a third of $10.

3. To entitle one to be a competitor he must be a member of the Junior Class, taking a regular course.

4. Subjects for the oration shall be announced at the beginning of the first term of every year, and upon one of these each competitor shall write an oration not to exceed eight minutes in delivery.

5. Each oration shall bear upon its first page a fictitious name or motto, and shall be accompanied by a sealed envelope, which shall be superscribed with the same name or motto, and an address by which it may be reclaimed. The envelope shall contain the real name and address of the writer, with the declaration that the oration is his own original work. The examiner, having adopted a standard of excellence, may reject any or all of the orations presented which do not attain to this standard; of such as do —should they be sufficient in number—the best six shall be chosen, and their envelopes opened. The others shall be returned to the address given with their envelopes unopened.

6. The Executive Committee of the Alumni Association, or a committee of not fewer than three to be appointed by

them, shall hear the competitors whose orations shall have been approved, and the awards shall be made by a majority of these judges.

7. In awarding the prizes the judges shall consider both the literary merits and the delivery of each oration.

8. These rules are subject to amendment by the Faculty.

At the last contest the competitors were as follows:

William Conklin Anderson, of New York City.
Robert Ferriday, of South Bethlehem.
Elwood Aristides Grissinger, of Mechanicsburg.
Arthur Williston Henshaw, of Amherst, Mass.
Barry Holme Jones, of Bethlehem.
Ruel Chaffee Warriner, of Montrose.

The First Prize was awarded to William Conklin Anderson: the Second, to Ruel Chaffee Warriner; the Third, to Robert Ferriday.

The next contest will take place February 22, 1894.

ENTRANCE EXAMINATION PAPERS.

Used for Examination in 1893.

[Requests for other examination papers than those herein printed can not be granted.]

I.—ENGLISH.

I. *a*) Illustrate the following constructions by sentences: —*Apposition*, *Nominative Independent*, *Indirect Object*.

b) State the character of each of your sentences: whether *loose* or *periodic*.

II. *a*) Write sentences illustrating the uses of *shall* and *will*, *would* and *should*— as fully as you can.

b) What do you understand by *Style?*

III. *a*) Which of these two sentences do you prefer:— *If I were he, I would do it in a minute;* or, *If I was he, I should do it in a minute?* State the reasons for your choice.

b) Criticise and correct the following sentences:—

He would better go; for, if he stays, he will meet some very disagreeable people.

He will find no one here when he will come.

IV. Punctuate and analyze the following sentence:—

When they arrived at the spot where he had agreed to meet them they sat in the little valley which was still green and through which flowed a shrunken shallow river wrinkled by the wind like the withered face of an old man and concluded to wait until he should come but although it was already late for the time which he had named was long passed they were far from impatient being well pleased at the opportunity of resting a while in so pleasant a place after the length of their journey and the extreme heat of the day for it was midsummer the time of the drought.

V. Write an essay of two hundred words on one of the following subjects:—

a) The plot of Shakespeare's *Henry the Eighth*.

b) The Boyhood of David Copperfield.

II.—GEOGRAPHY.

Outline maps of the central part of the United States and of Northern Europe, were furnished to each applicant and he was required to draw the boundaries of countries, provinces, states, and territories, and name them, to place and name the capital or chief city of each, and the principal rivers and mountain systems.

III.—UNITED STATES HISTORY.

1. *a*. What is meant by *charter government*, *proprietary government*, *royal government?*
   b. Under what form of government was Massachusetts settled?
   c. State what changes were afterwards made in the government, when and by whom they were made.

3. Which was the last important battle that settled the supremacy of the English over the French on the American continent?

4. Give an account of the leading events during Madison's administration.

5. What campaigns took place in 1863? Name the principal events of each.

6. When was arbitration in international questions first resorted to?

CONSTITUTION.

1. *a*. How are the members of each of the two branches of Congress chosen in the several States?
   b. How is the presiding officer of each branch chosen?

2. What is the last amendment to the Constitution?

3. What is the impeachment of a president? Who conducts it? Was any president impeached?

4. Who decides on the constitutionality of a law enacted by Congress?

IV.—ARITHMETIC.

I. (*a*) What is an odd number? an even number? a prime number? a factor? a multiple? common multiple of two or more numbers?

(*b*) State method of finding the least common multiple of two or more numbers.

(*c*) What is a fraction? How many kinds of fractions are there, and what are they?

II. (*a*) How is addition of common fractions performed? How is one fraction divided by another?

(*b*) How many feet in a metre? How many metres in a kilometre? How many pints in a litre? How many litres in a hectolitre?

(*c*) What are stocks and bonds? When are they said to be at par? at a premium? at a discount?

III. In 10 gallons 3 quarts $1\frac{1}{3}$ pints, how many litres?

IV. 25 is 25 per cent of what number? $\frac{1}{5}$ is $\frac{1}{5}$ per cent of what number?

V. Find interest, discount, and bank discount on $25.00 for 60 days at $4\frac{1}{2}$ per cent.

VI. A cylindrical cistern has the following dimensions: diameter $2\frac{1}{2}$ metres, depth $3\frac{1}{4}$ metres. How many gallons of water will it contain?

V.—GEOMETRY.

I. (*a*) Define geometry; a theorem; a corollary; a lemma; a postulate.

(*b*) What is a surface? a plane surface? a curved surface?

(*c*) What is a locus? and give an illustration.

(*d*) What are the segments of a line? the segments of a circle?

(*e*) When are two points symmetrical with respect to an axis? When is a polygon symmetrical with respect to a centre?

II. (*a*) What is a proportion? a continued proportion? When is a proportion said to be taken by alternation? by inversion? by composition? by division? Illustrate.

(*b*) When is a straight line said to be divided harmonically?

(*c*) What are similar polygons? The conditions which render two triangles similar? The ratio of similitude of similar polygons?

(*d*) What is the area of a circular sector? Of a circle in terms of its radius? The ratio of the areas of two circles?

(*e*) What is meant by the angle included between two straight lines in space which do not intersect? The plane angle of a diedral angle?

III. The three medial lines of a triangle pass through a common point.

IV. If the opposite sides of a quadrilateral are equal, or if the opposite angles are equal, the figure is a parallelogram.

V. The angles at the centre of a circle are proportional to their intercepted arcs when the arcs are commensurable, also when they are incommensurable.

VI. Find the square of a side of a triangle opposite an obtuse angle.

VII. Construct a polygon similar to a given polygon, the ratio of similitude being 3 to 2.

VIII. The ratio of the areas of triangles having an angle common is the ratio of the products of the sides about the common angle.

IX. Given the perimeters of inscribed and circumscribed regular polygons of the same number of sides, to compute the perimeters of inscribed and circumscribed regular polygons of double the number of sides.

X. In a triedral angle any face-angle is less than the sum of the other two.

VI.—ALGEBRA.

1. (*a*) Define terms; factors; coëfficients; exponents.

   (*b*) When is a monomial radical in its simplest form, and what are the conditions under which a radical may be simplified?

   (*c*) Define a system of notation, and state some advantages of a literal notation over a numerical.

2. (*a*) Define an arithmetical and a geometrical progression, and write the formulæ for determining l and s in a geometrical progression.

   (*b*) State rule for finding lowest common multiple of several quantities that are readily factored; also of two quantities that are not easily factored.

   (*c*) Write the general form of a quadratic equation, and the value of x in such equation.

3. (*a*) State the conditions under which a binomial may be resolved into binomial factors, and the character of the factors in each case.

   (*b*) When are four quantities said to be proportional? When are three quantities said to be proportional? When are two quantities said to be proportional?

   (*c*) Define a proposition; a theorem; a problem.

4. Divide $\frac{x^3}{y^3}+\frac{5x^2}{12y^2}+\frac{39}{16}$ by $\frac{x}{3y^2}+\frac{1}{2y}$ without reducing. Rationalize the denominator of $\frac{2}{\sqrt{3}+\sqrt[3]{4}}$.

5. Resolve x^6+y^6; x^6-y^6; x^2-y^2+2x+1; $x^2-y^2+2xy\sqrt{-1}$; $1-x+x^2-x^3$ into prime factors.

6. Solve the following:

$$\frac{2x-1}{\sqrt{2x+1}}=\frac{\sqrt{2x-1}}{2}+2;\ \text{(verify.)}\qquad \sqrt{x+x^2}-x=\tfrac{1}{3}.$$

7. A certain number of two digits equals three times their sum, and if 45 be added to it the digits are reversed. Required, the number.

8. Solve the following:

$$\sqrt{1+x^2}+\sqrt{1+x^2+\sqrt{1-x^2}}=\sqrt{1-x^2}. \quad \frac{x+\sqrt{x}}{x-\sqrt{x}}=\frac{3\sqrt{x}+6}{2\sqrt{x}};\ \text{(verify.)}$$

9. A rectangular plot of ground whose width is $\frac{2}{3}$ its length has a 4-foot walk around it, and the area of the walk equals that of the plot. Required, the dimensions of the plot.

10. Solve the following:

$$x-y=1; \qquad x^2+xy=12;$$
$$x+\sqrt{x^2-y^2}=8. \qquad xy-2y^2=1.$$

VII.—PHYSICS.

1. Define:
   - *a.* C. G. S. units.
   - *b.* Gravitation.
   - *c.* Compound pendulum.
   - *d.* Machine.
   - *e.* Farad.
   - *f.* Electrostatic unit of quantity.
   - *g.* Induced currents.
   - *h.* Astatic needle.
   - *i.* Resonance.
   - *j.* Beats.
   - *k.* Thermal unit.
   - *l.* Radiant heat.
   - *m.* Mechanical equivalent of heat.
   - *n.* Polarized light.
   - *o.* Refraction of light.

2. Derive the formulae for kinetic energy and for velocity of a liquid issuing from an orifice.

3. A body weighing 1000 lbs. is rolled down an inclined plane 2000 ft. long and 500 ft. high; find (1) its final velocity, (2) amount of ice at —10°C., its kinetic energy can convert into steam at 125°C. (Sp. ht. ice = .505; sp. ht. of steam = .4805).

4. A piece of metal weighs 14.3 g. in air, 11.3 g. in benzine (sp. gr. 8.8); what is (1) its specific gravity, (2) its weight in turpentine (sp. gr. .85), (3) its weight in air, (4) its volume?

5. How long must a current of 10 amperes flow through a wire weighing 5 g., having a resistance of 10 ohms, immersed in 10 g. of alcohol, to raise the temperature of the wire and of the alcohol from 0° to 10°C? (Sp. ht. of wire .0324; sp. ht. of alcohol .505.)

6. A certain string vibrates 100 times a second. With how much weight must a string of the same material, but twice the weight per linear unit, and three times as long be stretched to vibrate 200 times per second?

7. What will be the resulting temperature of the following mixture:

10 lbs. ice at — 10° (sp. ht. .505),
2 lbs. steam at 110° (sp. ht. .4805),
10 lbs. of water at 100°?

8. How could the specific heat of a piece of copper be found experimentally?

9. Describe the Fahrenheit hydrometer and tell how it is used.

10. Describe the Daniell's battery.

11. Explain how you convert temperatures given in centigrade degrees to Fahrenheit and conversely.

12. Tell the kind of image, real or virtual, erect or inverted and at what place formed with a convex lens when the object is at

a. principal focus,
b. between focus and lens,
c. between focus and center of curvature,
d. at center of curvature,
e. beyond center of curvature.

VIII.—PHYSICAL GEOGRAPHY.

1. Name the motions of the earth and tell what they produce.

2. Give the classification of islands and name an example of each.

3. Describe the principal waterfalls and caves.

4. Name the oceanic movements and give their causes and the effects they produce.

5. Explain the origin of land and sea breezes.

6. Explain the formation of rain, hail, snow, dew, and fog.

7. Name some of the optical phenomena of the atmosphere.

8. Name and locate the most important minerals of the United States.

9. What difference exists between the climate of the eastern and the western coasts of the United States?

10. When do the heaviest rains occur in the Atlantic States, and in what part of our country have we the heaviest rainfall?

IX.—LATIN.

Inflect in full: Imber, dea, deus, saltus, senex, fides; ferox, nullus, major, frugi, amans, mille; aliquis, idem.

Give the gender of alvus (belly), nauta, dies, nomen, with the reason for each.

Compare nequam, exterus, carus and idoneus.

Give the complete synopsis of soleo and nitor; and the principal parts of tono, cano, tondeo, teneo, and tollo.

Inflect the present tense of fio and possum.

Explain the meaning of the endings in the words ovile, vivarium, cantor, and Sullanus.

What are inceptive and frequentative verbs, and how are they formed?

State the use of the supine in u.

Describe, with examples, the various ways in which purpose is expressed in Latin.

What are the independent uses of the subjunctive?

What particles are employed in asking questions and how do they differ?

How do you render into Latin "I fear that he will die?"

Translate:

I. Caesar singulis legionibus singulos legatos et quaestorem praefecit, uti eos testes suae quisque virtutis habe-

ret; ipse a dextro cornu, quod eam partem minime firmam hostium esse animadverterat, proelium commisit. Ita nostri acriter in hostes, signo dato, impetum fecerunt, itaque hostes repente celeriterque procurrerunt, ut spatium pila in hostes coniciendi non daretur. Rejectis pilis, cominus gladiis pugnatum est. At Germani celeriter, ex consuetudine sua phalange facta, impetus gladiorum exceperunt.

Explain the syntax of legionibus, haberet, gladiis.

II. Ubii autem, qui uni ex Rhenanis ad Caesarem legatos miserant, amicitiam fecerant, obsides dederant, magnopere orabant ut sibi auxilium ferret, quod graviter ab Suevis premerentur; vel, si id facere occupationibus reipublicae prohiberetur, exercitum modo Rhenum transportaret: id sibi ad auxilium spemque reliqui temporis satis futurum. Tantum esse nomen atque opinionem ejus exercitus, Ariovisto pulso et hoc novissimo proelio facto, etiam ad ultimas nationes, uti opinione et amicitia populi Romani tuti esse possint. Navium magnam copiam ad transportandum exercitum pollicebantur.

Point out what principles of the indirect discourse are illustrated in this passage. How is Rhenum governed? What is the syntax of reliqui temporis?

III. Est mihi tanti, Quirites, hujus invidiae falsae atque iniquae tempestatem subire, dum modo a vobis hujus horribilis belli ac nefarii periculum depellatur. Dicatur sane ejectus esse a me, dum modo eat in exsilium. Sed, mihi credite, non est iturus. Numquam ego a dis immortalibus optabo, Quirites, invidiae meae levandae causa, ut L. Catilinam ducere exercitum hostium atque in armis volitare audiatis: sed triduo tamen audietis; multoque magis illud timeo, ne mihi sit invidiosum aliquando, quod illum emiserim potius quam quod ejecerim.

What is the syntax of tanti, and causa?

IV. Majores nostri saepe mercatoribus aut naviculariis nostris injuriosius tractatis bella gesserunt: vos, tot milibus civium Romanorum uno nuntio atque uno tempore necatis, quo tandem animo esse debetis? Legati quod erant appellati superbius, Corinthum patres vestri totius Graeciae lumen exstinctum esse voluerunt: vos eum regem inultum esse patiemini, qui legatum populi Romani consularem vinculis ac verberibus atque omni supplicio excruciatum necavit? Illi libertatem imminutam civium Romanorum non tulerunt: vos ereptam vitam neglegetis?

V. Hic aliud maius miseris multoque tremendum
obicitur magis, atque improvida pectora turbat.
Laocoön, ductus Neptuno sorte sacerdos,
sollemnis taurum ingentem mactabat ad aras.
Ecce autem gemini a Tenedo tranquilla per alta—
horresco referens—immensis orbibus angues
incumbunt pelago, pariterque ad litora tendunt;
pectora quorum inter fluctus arrecta iubaeque
sanguineae superant undas; pars cetera pontum
pone legit, sinuatque immensa volumine terga.

Write out the first three lines, indicating the feet and the caesural pause.

VI. Iamque propinquabant scopulo metamque tenebant,
cum princeps medioque Gyas in gurgite victor
rectorem navis compellat voce Menoeten:
'Quo tantum mihi dexter abis? Huc dirige gressum;
litus ama, et laevas stringat sine palmula cautes;
alum alii teneant.' Dixit; sed caeca Menoetes
saxa timens proram pelagi detorquet ad undas.
'Quo diversus abis?' iterum 'Pete saxa, Menoete!'
cum clamore Gyas revocabat; et ecce Cloanthum
respicit instantem tergo, et propiora tenentem.

VII. Caesar, ut Brundisium venit, contionatus apud milites, quoniam prope ad finem laborum ac periculorum esset perventum, aequo animo mancipia atque impedimenta in Italia relinquerent, ipsi expediti naves conscenderent, quo maior numerus militum posset imponi, omniaque ex victoria et ex sua liberalitate sperarent, conclamantibus omnibus, imperaret, quod vellet, quodcumque imperavisset, se aequo animo esse facturos, II Non. Ian. naves solvit.

Translate into Latin:

Caesar sent Titus Labienus, his lieutenant, to make an attack upon the camp of the enemy. He, having drawn up a line of battle, gave the enemy an opportunity of fighting immediately, and the forces of the Gauls did not dare to come out of their own camp. After three days, when he saw that he could not persuade them to fight, he led his soldiers back to the army.

Many writers have praised the genius of Caesar, and he is to be regarded as the greatest commander that Rome ever produced. Even today we read his commentaries with admiration and interest.

ROMAN HISTORY.

1. Give the names of the kings, and state what each is said to have done.

2. Narrate the life of Marius.

3. Mention the chief steps in the struggle between the patricians and plebeians for the possession of political power.

4. Who formed the two triumvirates, and what battles were fought between them and their adversaries?

5. Give the life of Cicero.

X.—GREEK.

I. GRAMMAR.

1. Write the following passage with proper accents and breathings:

ῳετο δε αρκειν προς το αρχικον ειναι και δοκειν τον μεν καλως ποιουντα επαινειν, τον δε αδικουντα μη επαινειν. τοιγαρουν αυτῳ οι μεν καλοι τε καγαθοι των συνοντων ευνοι ησαν, οι δε αδικοι επεβουλευον ως ευμεταχειριστῳ οντι. οτε δε απεθνησκεν ην ετων ως τριακοντα.

2. Decline throughout *πολίτης, νοῦς, σώφρων* (both genders); through the singular, *μοῦσα, ὁδός, βοῦς, ἠχώ*; through the plural, *πόλις, εὐγενής* (both genders), *χαρίεις* (three genders).

3. Compare the adjectives *μικρός, πολύς, ἐχθρός*; the adverb *μάλα*.

4. Give the Greek words for *six*, *tenth*, *four times ;* decline the words for *two*, *three.*

5. Give the principal parts of αἱρέω, φέρω, τάττω; the synopsis (*i.e.*, first form of each mode) of the aorist, active middle and passive, of ἵημι; the inflection through the numbers and persons of the perfect indicative, active and middle, of πράττω, and the imperfect indicative, active and middle, of ὁράω; the present participle, dative plural, of τίθημι.

6. Decline τοιοῦτος; translate *to us*, *of ourselves*, *which* (*of two*)*?*, *how much?*, *somewhere*, *when?*

7. Name three classes of verbs that govern the dative; five prepositions that govern both genitive and dative, giving their meanings with each case.

8. What is the meaning of the subjunctive when used in an independent sentence? of the optative?

9. ἐὰν Κῦρος ἔλθῃ, αὐτὸν ὄψομαι; εἰ Κῦρος ἦλθεν, αὐτὸν ἂν εἶδον. Translate these two sentences and explain the difference between them.

10. τοῦτο ποιήσας ἀπέθανε; ὁ τοῦτο ποιήσας ἀπέθανε; δῆλος ἦν τοῦτο ποιήσας. Translate and explain the different uses of the participle.

II. XENOPHON.

1. *Translate:*

Παρεκάλεσα ὑμᾶς, ἄνδρες φίλοι, ὅπως σὺν ὑμῖν βουλευόμενος ὅ,τι δίκαιόν ἐστι καὶ πρὸς θεῶν καὶ πρὸς ἀνθρώπων, τοῦτο πράξω περὶ Ὀρόντα τουτουί. τοῦτον γὰρ πρῶτον μὲν ὁ ἐμὸς πατὴρ ἔδωκεν ὑπήκοον εἶναι ἐμοί· ἐπεὶ δὲ ταχθείς, ὡς ἔφη αὐτός, ὑπὸ τοῦ ἐμοῦ ἀδελφοῦ οὗτος ἐπολέμησεν ἐμοὶ ἔχων τὴν ἐν Σάρδεσιν ἀκρόπολιν, καὶ ἐγὼ αὐτὸν προσπολεμῶν ἐποίησα ὥστε δόξαι τούτῳ τοῦ πρὸς ἐμοῦ πολέμου παύσασθαι, καὶ δεξιὰν ἔλαβον καὶ ἔδωκα.

Explain the construction of πράξω, δόξαι, πολέμου.

2. *Translate:*

Καὶ Ξενοφῶν μὲν καὶ οἱ σὺν αὐτῷ εἰπόντες τοῖς ἀσθενοῦσιν, ὅτι τῇ ὑστεραίᾳ ἥξουσί τινες ἐπ᾽ αὐτούς, πορευόμενοι πρὶν τέτταρα στάδια διελθεῖν ἐντυγχάνουσιν ἐν τῇ ὁδῷ ἀναπαυομένοις ἐπὶ τῆς χίονος τοῖς στρατι-

ώταις ἐγκεκαλυμμενοις, καὶ οὐδὲ φυλακὴ οὐδεμία καθειστήκει· καὶ ἀνίστασαν αὐτούς. οἱ δ' ἔλεγον, ὅτι οἱ ἔμπροσθεν οὐχ ὑποχωροῖεν. ὁ δὲ παριὼν καὶ προπέμπων τῶν πελταστῶν τοὺς ἰσχυροτάτους ἐκέλευσε σκέψασθαι, τί εἴη τὸ κωλῦον. οἱ δ' ἀπήγγελλον, ὅτι ὅλον οὕτως ἀναπαύοιτο τὸ στράτευμα.

Explain the construction of *διελθεῖν, ὑποχωροῖεν, εἴη.* Where is *ἀνίστασαν* made? *κωλῦον*?

III. Xenophon, at sight.

Κατανενόηκας, ἔφη, ὦ Περίκλεις, ὅτι πρόκειται τῆς χώρας ἡμῶν ὄρη μεγάλα, καθήκοντα ἐπὶ τὴν Βοιωτίαν, δι' ὧν εἰς τὴν χώραν εἴσοδοι στεναί τε καὶ προσάντεις εἰσίν; Καὶ μάλα, ἔφη. ἐκεῖνο δ' ἀκήκοας, ὅτι Μυσοὶ καὶ Πισίδαι ἐν τῇ βασιλέως χώρᾳ κατέχοντες ἐρυμνὰ πάνυ χωρία καὶ κούφως ὡπλισμένοι δύνανται πολλὰ μὲν τὴν βασιλέως χώραν καταθέοντες κακοποιεῖν, αὐτοὶ δὲ ζῆν ἐλεύθεροι.

κατανοέω, observe.	*πρόκειμαι*, lie in front of.
προσάντης, steep.	*καὶ μάλα*, yes, indeed.

IV. Homer.

1. *Translate:*

εὕδεις, Ἀτρέος υἱὲ δαΐφρονος ἱπποδάμοιο·
οὐ χρὴ παννύχιον εὕδειν βουληφόρον ἄνδρα,
ᾧ λαοί τ' ἐπιτετράφαται καὶ τόσσα μέμηλεν.
νῦν δ' ἐμέθεν ξύνες ὦκα· Διὸς δέ τοι ἄγγελός εἰμι,
ὅς σευ ἄνευθεν ἐὼν μέγα κήδεται ἠδ' ἐλεαίρει.
θωρῆξαί σ' ἐκέλευσε κάρη κομόωντας Ἀχαιοὺς
πανσυδίῃ· νῦν γάρ κεν ἕλοις πόλιν εὐρυάγυιαν
Τρώων·

By whom were these words uttered? To whom? With what result?

Give the Attic forms of *Ἀτρέος, ἐπιτετράφαται, ἐμέθεν, ἐών.*

Where is *ξύνες* made? From what present?

2. *Translate:*

ὄρσεο, Λαομεδοντιάδη, καλέουσιν ἄριστοι
Τρώων θ' ἱπποδάμων καὶ Ἀχαιῶν χαλκοχιτώνων
ἐς πεδίον καταβῆναι, ἵν' ὅρκια πιστὰ τάμητε.
αὐτὰρ Ἀλέξανδρος καὶ ἀρηΐφιλος Μενέλαος
μακρῇς ἐγχείῃσι μαχήσοντ' ἀμφὶ γυναικί·
τῷ δέ κε νικήσαντι γυνὴ καὶ κτήμαθ' ἕποιτο.

3. *Arrange in a hexameter line:*
Μενοιτιάδῃ, ἑτάροισιν, ἧιε, οἷς, σύν, καί, τε.

V. HISTORY.

1. State what you know of the governments of Athens and of Sparta at the time of the outbreak of the Peloponnesian War.

2. What changes of government took place in Greece between the Homeric and the historic periods?

3. Arrange in chronological order: Alexander the Great, Aristotle, Miltiades, Pericles, Plato, Socrates, Solon.

4. By how many years did Cyrus the Great precede the younger Cyrus? What was the relationship between them? What claim had the younger Cyrus to the throne?

5. Tell the story of the Athenian Expedition against Syracuse.

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CLASS OF 1878.

Charles Bull, M.E., Assistant Librarian and Bursar, General Theological Seminary, Chelsea Square, New York City.

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*Deceased.

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CLASS OF 1879.

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*Augustus Stoughton Ross, M.E.

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*George Arthur Ruddle, Ph.B.

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Harry Eugene Stout, B.S., Audenried, Pa.

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Rev. William Patterson Taylor, B.A., Burlington, N. J.

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CLASS OF 1887.

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* Deceased.

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CLASS OF 1890.

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The number of graduates is 584, degrees having been conferred as follows:

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Of these, 1 has taken the degrees of B.A. and B.M.; 9 of B.A. and M.A.; 2 of B.S. and C.E.; 1 of B.S. and A.C.; 11 of B.M. and E.M.; 27 of B.S. and E.M.; 1 of B.M., E.M., and A.C.; 1 of B.S., E.M., and C.E.; 1 of C.E. and E.M.; 2 of A.C. and E.M.; 1 of A.C., M.S., and Ph.D. 558 graduates are still living.

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Edgar R. Reets, ('91), Lehigh Valley Railroad, South Bethlehem, Pa.

Frank Schütte, ('91), Lewisburg, Pa.

John Stewart, ('92), Mine Foreman, Lonaconing, Md.

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The Register is sent to all graduates who furnish their addresses for the purpose, and to all other persons on application to

THE PRESIDENT OF THE LEHIGH UNIVERSITY,
South Bethlehem, Pa